American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Foundry Methods Improve Investment Castings

What Dies for Thin-Metal Stampings?

How Gear Shaving Works

Simplify your small-lot grinding

on this Completely New Heald Model 271 Plain Internal

● HERE'S a brand new Heald Internal Grinder —the Model 271 Plain—that simplifies setups and minimizes changeover time between jobs. Handles straight or taper grinding and precision facing work on a wide variety of parts . . . and is especially designed for small to medium lot production runs where automatic sizing is not needed.

As in every new Heald machine, there's a wealth of research and engineering experience behind the Model 271 Plain. Many new, unique features give you:

FASTER SETUPS. Cycle feed rates and amounts set by individual graduated knobs; table stroke set by quickly adjusted self-locking reverse dogs; workhead quickly and accurately set for straight or taper work.

EASIER OPERATION. Centralized controls readily accessible without reaching; extra-sensitive handwheel provides full and effortless control of table.

MINIMUM MAINTENANCE. Isolated pump-and-tank unit pulls out from base; flared steel hydraulic tubing means leak-proof joints; electrical controls grouped in dust-proof box at rear.

For further information on the Heald Model 271 Plain, or others of the 19 all-new Heald machines, get in touch with the Heald branch office nearest you. Or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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BULLETIN AVAILABLE

listing complete features and specifications of new Model 271 Plain.

ANNOUNCING 19TH NEW HEALD MACHINE

TECHNOLOGY DEPARTMENT

American Machinist

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MAGAZINE OF METALWORKING PRODUCTION

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Chips and QUIPS

Our Cover . . . Precision is now being mechanized. Here, wax-injection apparatus developed recently by Allis-Chalmers engineers uses an Alemite high-pressure barrel pump to force melted Zyrox 51-30 wax from storage tank through hose lines to nozzles. The mold for a wax pattern is held by an air clamp while wax is injected through a Zerk fitting. Tank pump and hose lines are hot-water jacketed to keep wax at injection temperature, because a 15° variation in temperature makes a difference of 0.002 in. in a 3-in. final-casting dimension.

Such equipment as this makes tremendous differences in production rate. A pattern-molding press, shown in Kenneth Geist's article in this issue, speeded production from 110 to 1200 patterns per 8-hr shift. This Kodachrome was taken especially for *A.M.* by Henry Serdy, Allis-Chalmers photographer.

Very Special Report . . . Wallace C. Mills has been delighting our readers regularly for the past two years with his excellent articles on dies for thin-metal parts. We present herewith his masterpiece—on how die design and feeds are affected by expected production and production rates. Here is invaluable information, drawn from long experience for die designers and tool engineers generally. Extra copies are, as usual, available on request.

Materials Handling . . . F. W. Scooneas, plant engineer of the Detroit Engine Div., Kaiser-Frazer, explains how he used a barrel switch to solve a conveyor problem. . . . There are also a group of pictures showing work-handling ideas at the Buffalo plant of Westinghouse.

Post Mortem . . . Chester S. Ricker, our Detroit editor, discussed process control with the late R. H. McCarroll of Ford shortly before the latter's death. Mr. McCarroll gave him a number of ideas, which we are proud to present in this issue. "R. H." was a potent source of ideas in the Ford organization—a man whom we, and you, will miss.

Shaving . . . During the last several years, shaving has become a must for close-tolerance gears. To provide a comprehensive picture of what it is, and how it's done, we asked Sidney Cornell to put together the facts. This ties in with the A.G.M.A. annual meeting at Hot Springs, Va., June 6 to 9 . . . We've also the story on how Silex shaves costs with clever tooling, and a "before and after" case study on mechanizing the Bonderizing process.

Diagnosis . . . A doctor friend gives this definition of what happens to patients: "Treatment has been defined as the art or science of amusing a sick man with frivolous speculations about his disorder and of temporizing ingeniously, until nature either kills or cures him." The same routine is standard with our electrical-appliance repairman.

Auto Radio . . . John Sargrove, of Walton-on-Thames, England, has invented a fully automatic machine that makes three 2-tube radio sets a minute. Electronic controls supervise the whole operation, so the only attendant is a girl feeding molded plastic plates into a magazine. First order is for 100,000 sets for India if radio concentration reaches U.S. proportions *there* . . .

Coming . . . Next issue (June 17) will specialize in short articles, having a dozen or more featuring tooling and fabricating ideas alone . . . From Worcester (Mass.) Pressed Steel, we have 11 recent tooling techniques, including a tool cart . . . National Automatic Tool shows 5 or 6 other "specialist" tool carts . . . Then there are stories on tooling at Electrolux, carbide inserts to increase die life, spot-welding aluminum, applications for pneumatic cylinders, machining of lignum vitae, etc. . . . Materials-handling men will like the descriptions of a chute rack, the system in use at Jacobs, the conveyor installations at Stewart Die Casting . . . For administrative executives, there's a story on good vision, another on the management philosophy of Woodward Governor Co. . . . With other articles and regular departments, this issue will keep you reading for a long weekend.

GEAR SHAVER . . . Sidney Cornell, research engineer at the Instrumentation Lab., M.I.T., spent a year as a research engineer with the Woods Hole (Mass.) Oceanographic Institute (1946-47), but don't wonder from that how he appears as author of our current article on gear shaving. Here's the rest of his story: Born in Boston in 1914, he has his M.E. from M.I.T. (1936), was a gear engineer for Fellows Gear Shaper during 1936-38, and aircraft engineer for Lockheed 1938-39. Then he returned to Fellows as a research engineer for 3 years, from which he went in 1942 to Pratt & Whitney Aircraft as shop gear engineer and process engineer. He moved to the Oceanographic survey in 1946 and back to M.I.T. in 1947.

Mr. Cornell is the author of a number of papers on spur and helical gears and a member of the ASME and IAS. He also contributed to development of a new method of gear manufacture.

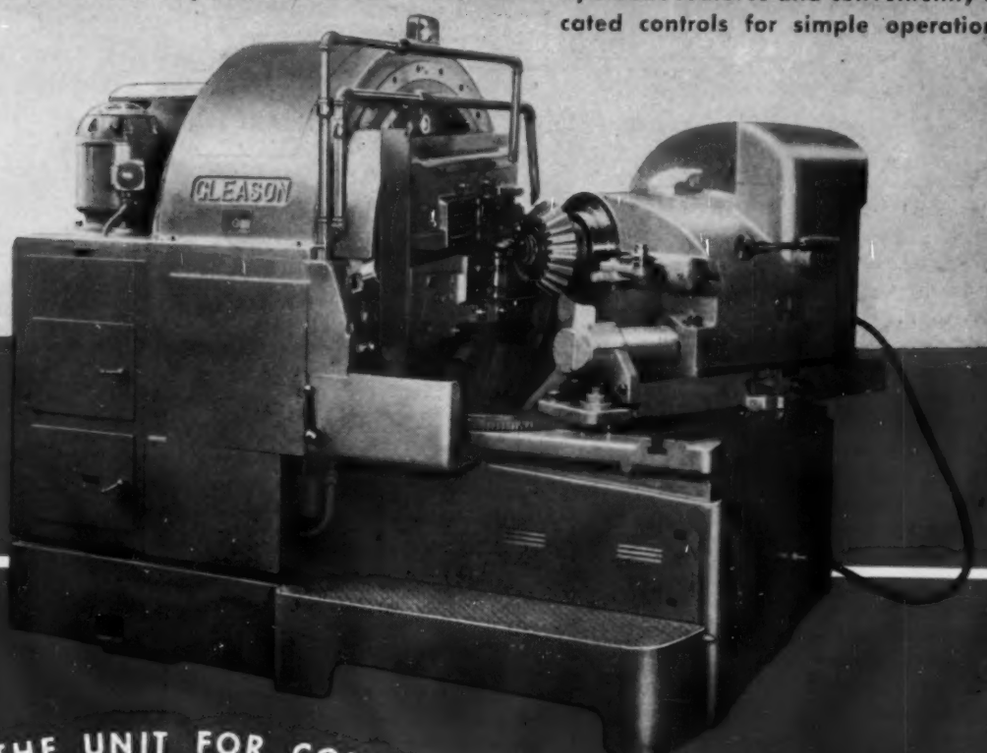
IT'S NEW!

. . . for the cutting of large Coniflex gears for power shovels and cranes, road machinery, ordnance, mining machinery, steel mill table drives and other heavy equipment.

GLEASON

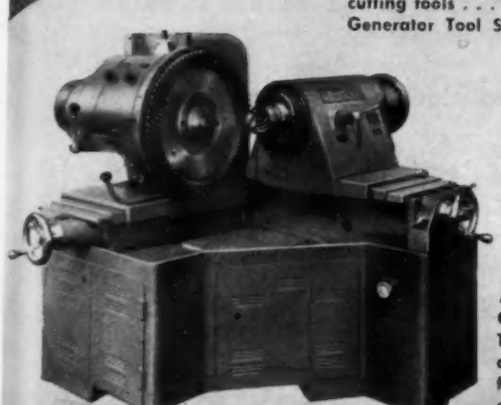
No. 24A STRAIGHT BEVEL GENERATOR

FEATURES: Coniflex gears with localization of tooth bearing automatically produced in any desired amount . . . close and *fast* roughing of *heavy* pitch gears using Tanruf and Tan-Acruf Tools . . . hydraulic features and conveniently located controls for simple operations.



COMPLETING THE UNIT FOR CONIFLEX GEAR PRODUCTION

Assure accuracy and smooth surface finish . . . obtain the greatest degree of life from cutting tools . . . with the Gleason No. 12 Generator Tool Sharpener.



A running test on the Gleason No. 27 Hypoid Tester—imitating actual operating position assures maintenance of uniform quality of gears during production . . . establishes best position in gears in final assembly.

GLEASON Works
1000 University Avenue
Rochester 3, N. Y. U. S. A.

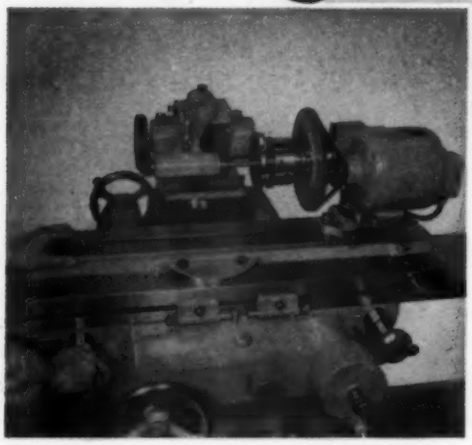
Builders of Bevel Gear Machinery for Over Eighty Years

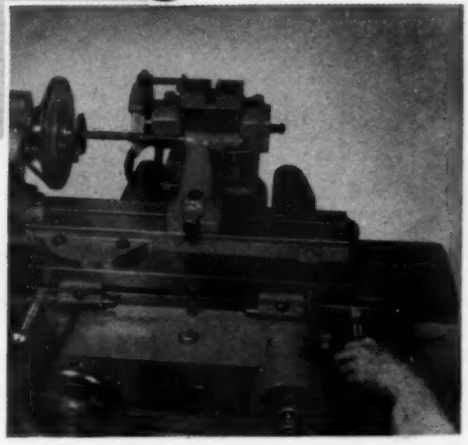
1. Most cutters are ground while the operator stands or sits at this corner behind the table.

2. Many left-hand cutters can be ground to advantage from this operation position.

3. Internal grinding operations are in full view when the operator stands at this front table control.

4. This operating corner will be appreciated when grinding short cylindrical sections such as the grooves in hydraulic plungers.





Above: Top view, showing table control knobs Nos. 1, 2, 3, 4 and the slow hand table traverse crank, No. 5. A view of the CINCINNATI No. 2 Cutter and Tool Grinder is superimposed over the drawing. Complete data may be obtained by writing for catalog M-1618.

There are no NEUTRAL CORNERS

Like a lot of action in your machine tools? You can have it at every corner of the new CINCINNATI No. 2 Cutter and Tool Grinder. The drawing highlights the table controls, and the four photographs show how they are used. There are no neutral corners . . . the operator now has a *choice of four control positions* for the table. And there are other new features which you can't afford to overlook:

a. Built-in electrical controls
b. Built-in oil-shot lubrication
c. Additional vertical range of wheelhead

Would you like to know more about the new CINCINNATI No. 2 Cutter and Tool Grinder? Write for catalog M-1618.

THE CINCINNATI MILLING MACHINE CO.

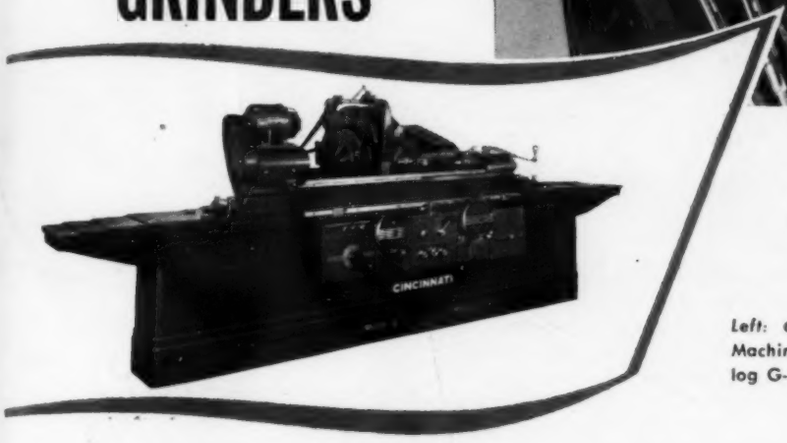
CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES

You can assign the *tough jobs* to CINCINNATI

FILMATIC

GRINDERS



Above: Grinding milling machine arbors, after the keywaying operation. The machine is a CINCINNATI FILMATIC 10" Plain Hydraulic.

Left: CINCINNATI FILMATIC 10" Plain Hydraulic Grinding Machine, catalog G-490-2. Also available in 14" L size, catalog G-533-1. Between-center lengths 18", 36", 48" and 96".

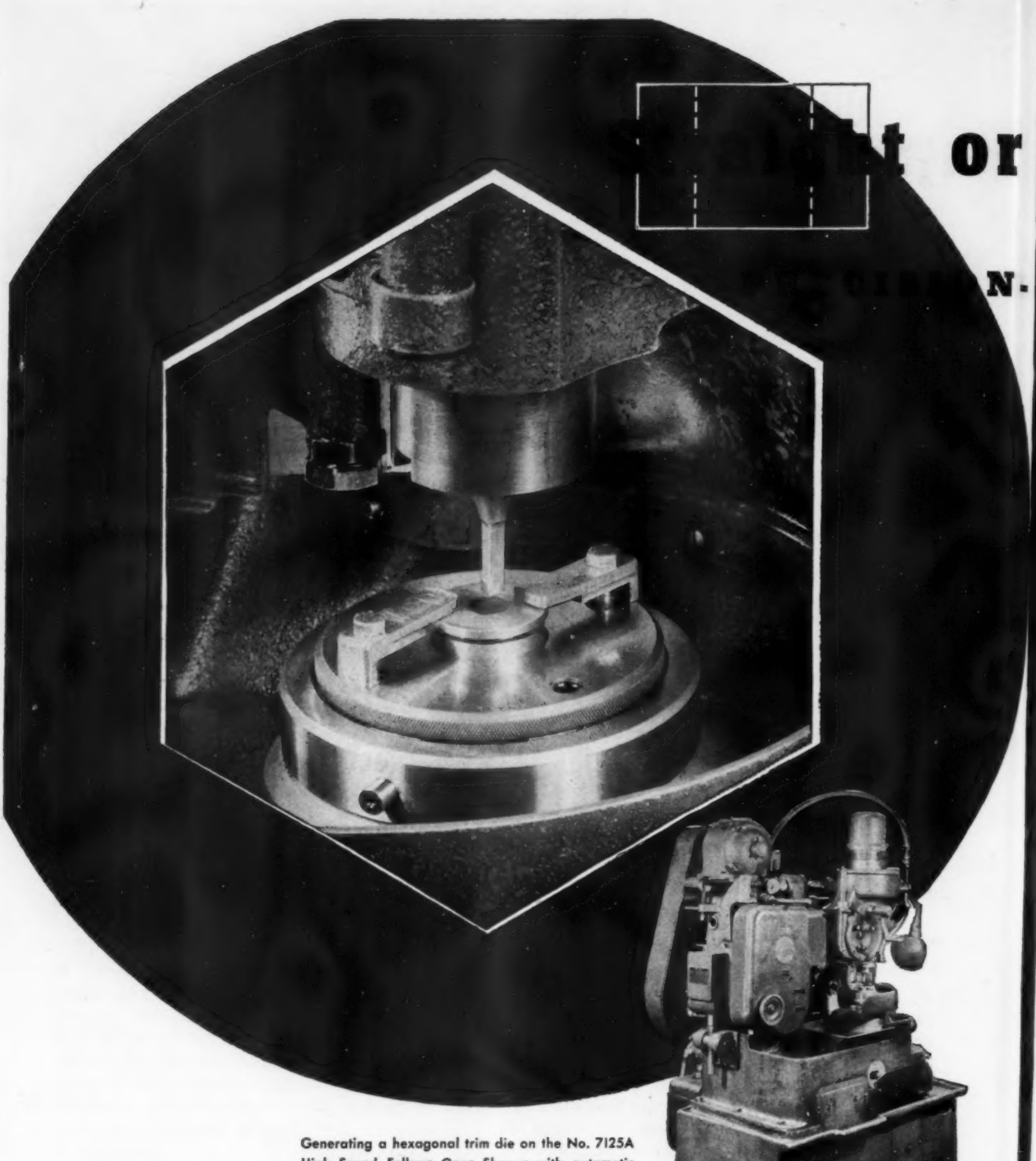
An intermittent diameter is not the easiest job in the world to grind, especially when the parts are slender. It takes a good man, *and* a good machine. Here's a helpful tip in grinding work of this type. Cut a number of rectangular wood strips of a size to fit tightly into the keyway. The length should exceed the width of shoe on the backrest. Drive the wood filler into the keyway at each backrest contact. Use a fairly hard wood, such as maple. This precaution will greatly aid in sizing the work; it will prevent the backrest shoes from being "chewed up." And here's another helpful tip . . . grind jobs of this type on CINCINNATI FILMATIC Grinders. These machines have many features of value in precision grinding any type of work within their range: FILMATIC grinding wheel spindle bearings; smooth gearless headstock drive with infinitely variable speeds over 4 to 1 ratio; infinitely variable table traverse rates 3" to 220" per minute; headstock rotation and coolant flow automatically start and stop with the table traverse, and many other features which contribute to low cost precision grinding. You may obtain complete data by writing for publication G-490-2.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



Generating a hexagonal trim die on the No. 7125A High-Speed Fellows Gear Shaper with automatic tilting mechanism at the Cleveland Cap Screw Company.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

Taper Trim Dies

FINISHED IN 12 TO 14 MINUTES

★High-Speed Gear Shaper Generates Square or Hexagon Contours for Bolt and Nut Dies Made From High-Speed Steel—To Accurate Specifications

Here is a case where the versatile Gear Shaper has been applied with success in converting round holes into square and hexagon holes for bolt and nut dies. The face widths of these dies vary from ⅝ to 2¼ inches, and are made with both straight and tapered holes up to 2½ degrees.

The ability of the Gear Shaper to generate symmetrical, or irregular contours, internal as well as external, carries suggestion to designers and shop men in a variety of industries. For a further indication of the wide versatility of the Gear Shaper, we suggest you ask for our 48-page illustrated book, "The Art of Generating With a Reciprocating Tool"...or better still, call in the Fellows Field Engineer on your production problems. The Fellows Gear Shaper Company, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Building, Detroit 2, Mich....or 640 West Town Office Bldg., Chicago 12, Ill., 7706 Empire State Bldg., New York 1, N. Y.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

Van Norman Company

acquires

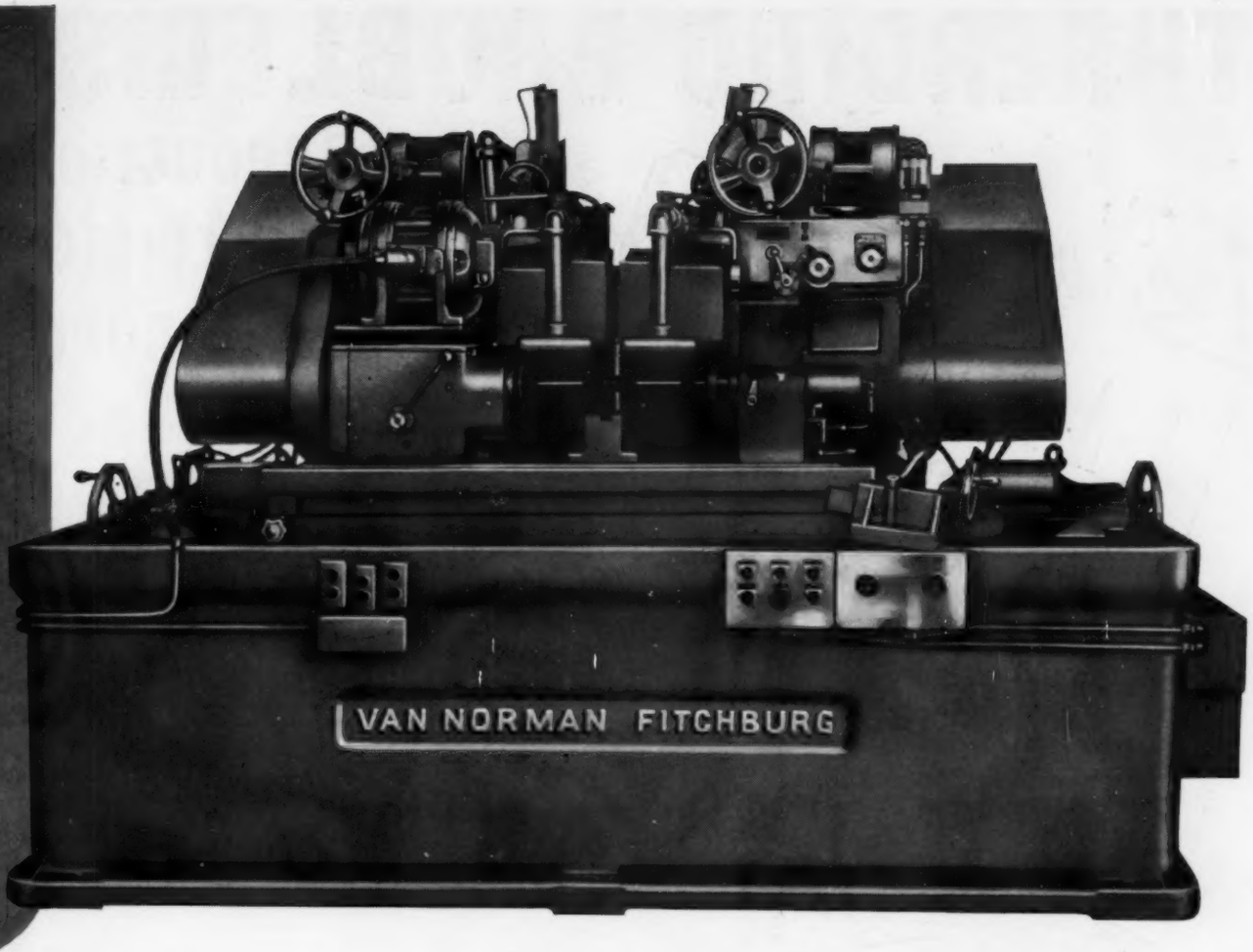
Fitchburg Grinding Machine Corp.

The Van Norman Company, manufacturers of milling machines and oscillating radius grinders, announces the purchase of the business, name and patents of the Fitchburg Grinding Machine Corporation.

Manufacturing operations will be moved to the modern Van Norman plant in Springfield. The Fitchburg line of Cylindrical Grinders, Angular Head Grinders, Spline and Gear Grinders, Consta-Contact Grinders and Bowgage Heads will be known as the "Van Norman Fitchburg Grinders."

If you have a grinding problem, it will pay you to consult Van Norman. Competent Engineers are available to help you with your particular requirements. Write for their services.

Van Norman Company,



VAN NORMAN FITCHBURG CYLINDRICAL GRINDERS for Automatic Mass-Production that Cuts Costs

It's not difficult for Van Norman to design and build surprisingly inexpensive, special purpose, automatic cylindrical grinding machines. We simply take one or more Van Norman Fitchburg Bowgage Wheelheads — the most efficient, completely automatic cycle wheelheads made — and mount them on a base best adapted to your particular requirements.

The result is an automatic mass-production grinding machine that is easy on its operator — easy on your tool budget — and enables you to produce at an amazingly low cost-per-piece.

Let Van Norman Engineers study your cylindrical grinding problems for maximum profitable production. There is no obligation for this service.

Springfield 7 · Massachusetts

THREADING PROBLEMS?

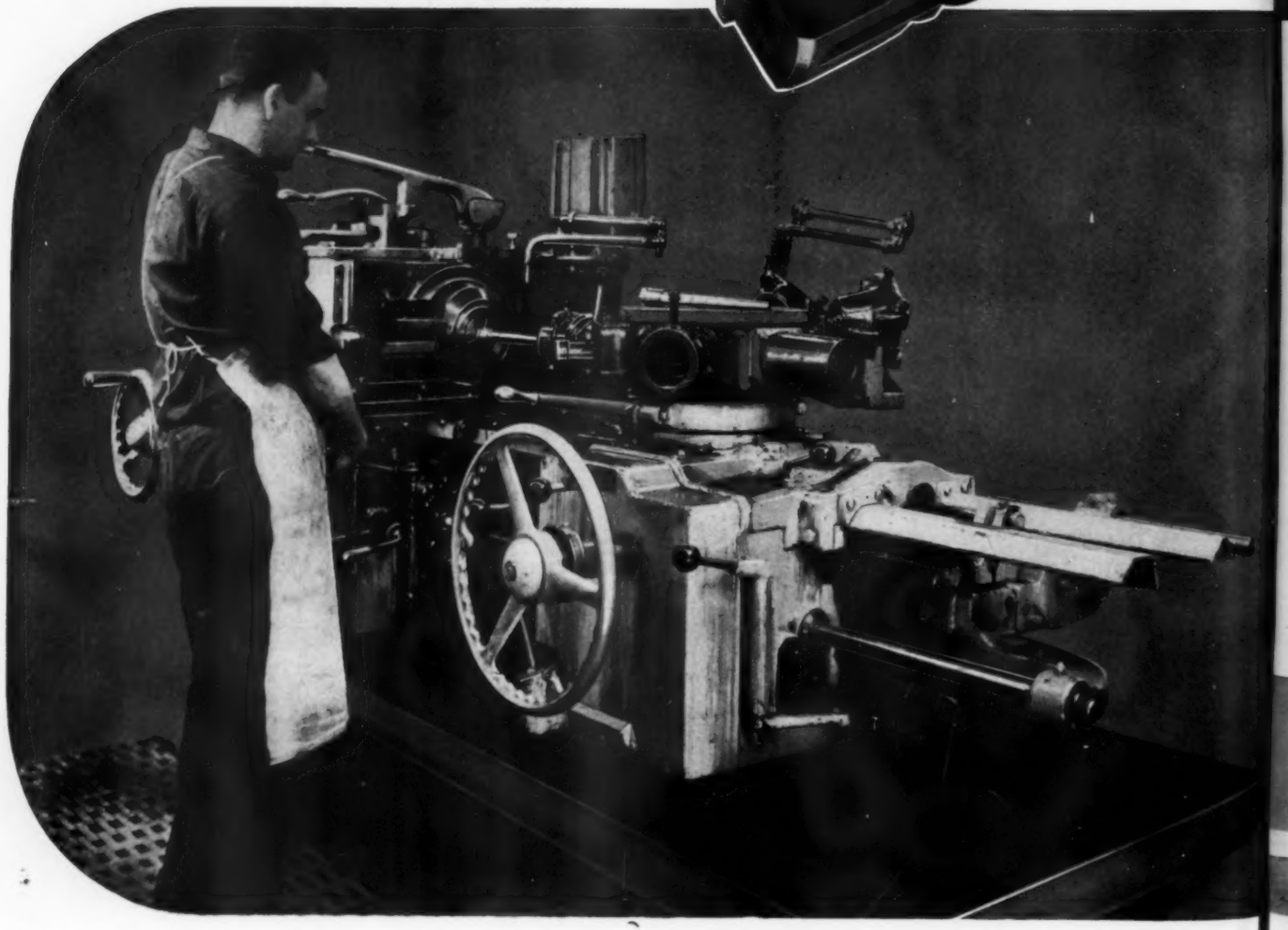
PRODUCTION?
ACCURACY?
ECONOMY?

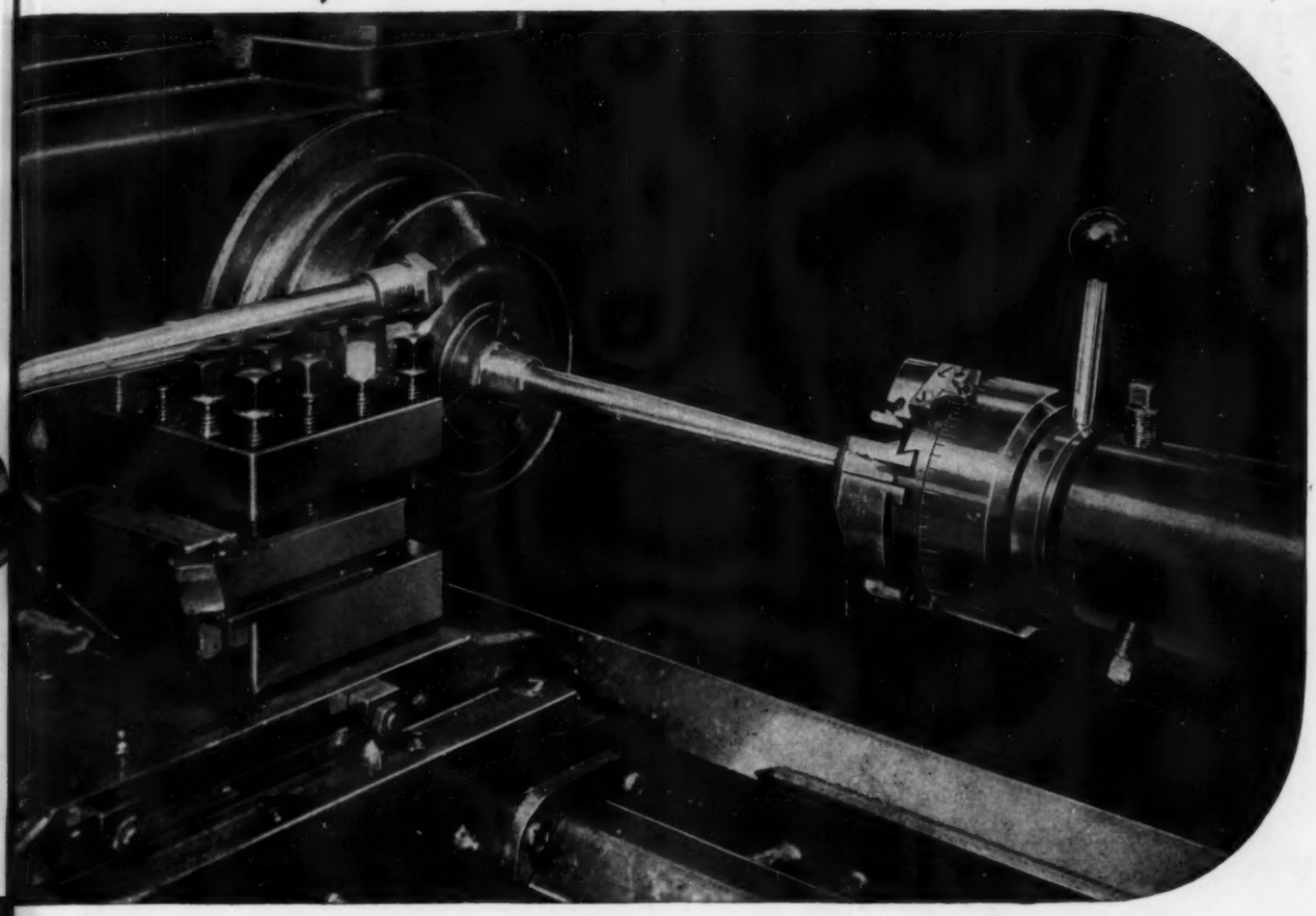
The Solution

LANDMATIC HEADS HARDENED & GROUND

For TURRET LATHE Threading Operations

LANDIS TRADE — MARK PAT. OFF.





The LANDMATIC 1¼" Hardened and Ground Die Head is illustrated cutting a ¾" pipe thread on a turret lathe in the plant of a nationally-known precision instrument manufacturer. The Drilled Sockets being machined in the illustrations are used with pressure type thermometers as a protecting sheath for the thermometer bulb. These parts are also made in 1" and 1¼" sizes.

The Type H LANDMATIC Die Head is a stationary self-opening die head designed for turret lathes and automatic screw machines employing a stationary type head. It is made in ⅝", ⅞", and 1¼" sizes. The 1¼" size illustrated will cut pipe threads ranging from ⅛" to ¾" in diameter. The LANDMATIC Type H Die Heads can be equipped with oversize chaser holders which make possible the threading of diameters larger than the rated capacity of the die head.

Write for Bulletin F-80

***The* LANDIS CHASER**

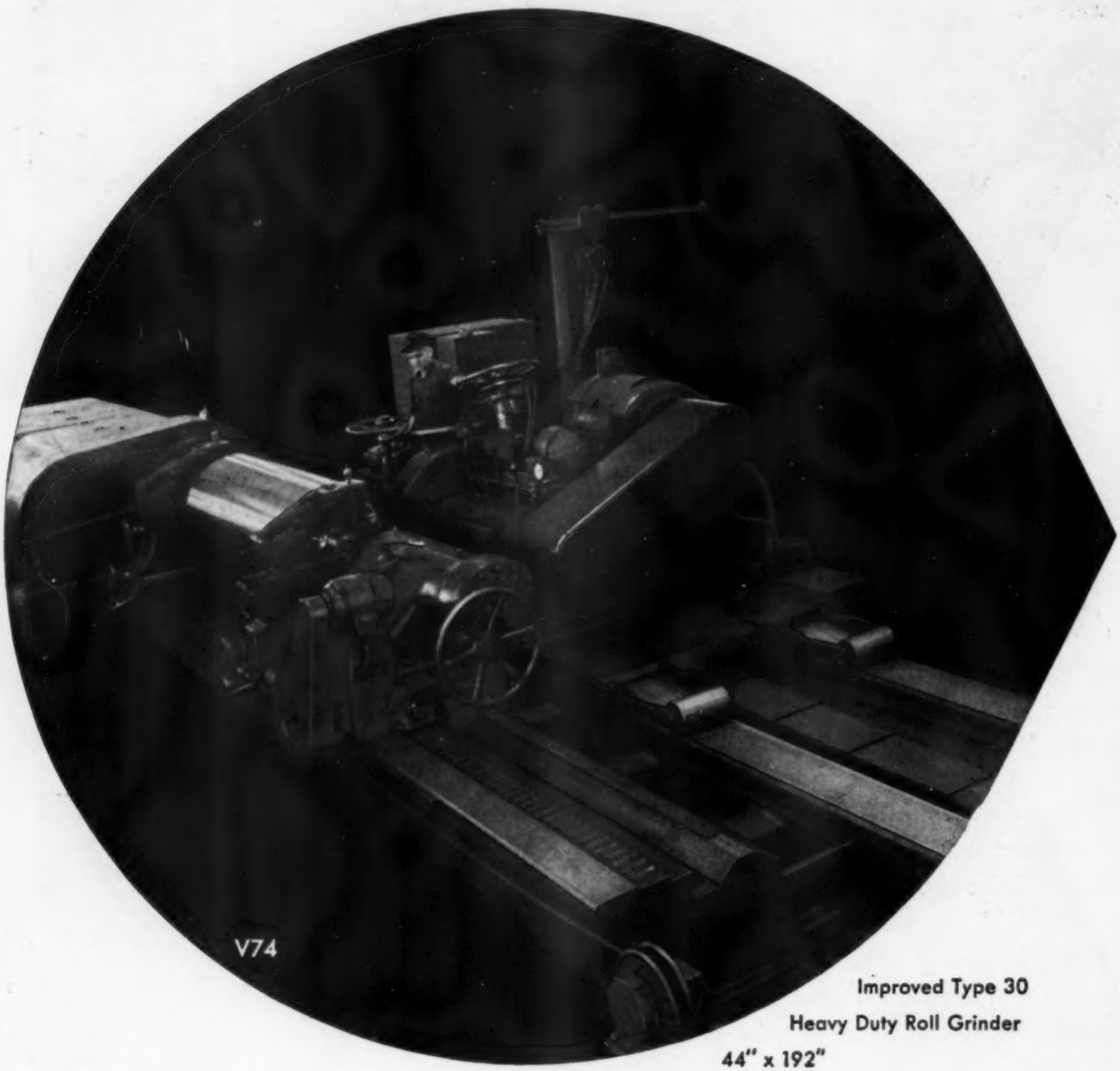
The Finest Thread Cutting Tool in Industry

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U.S.A.

FASTER–more accurate roll grinding

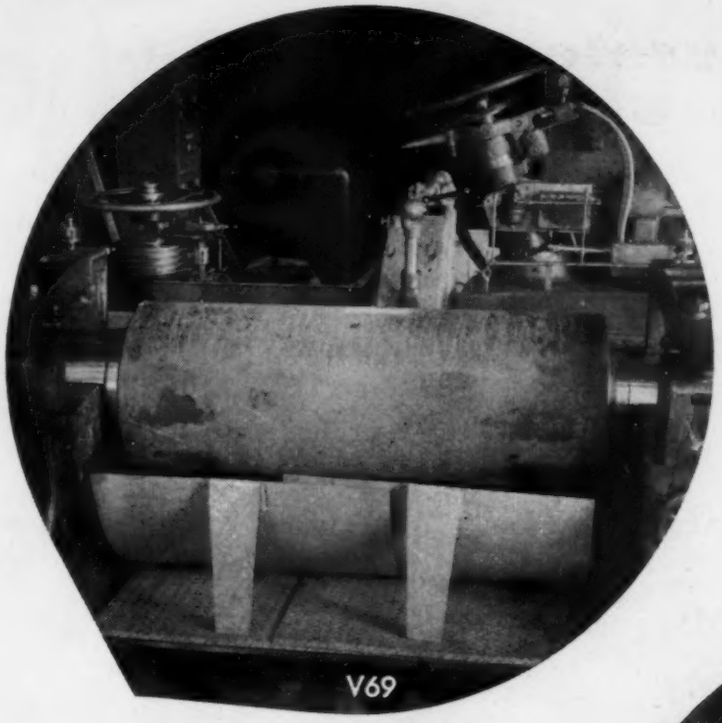
grinding from rough in one operation/saves 14 hours per roll



Improved Type 30
Heavy Duty Roll Grinder
44" x 192"

LANDIS TOOL
Precision Grinders

75



save 14 hours per roll

before	2½ days turning and finish grinding.
now	Grinding from rough, 6 hours, one operation.

for grinding all types of rolls

size	19" to 45" diameter by 24" to 120" length of body, weighing 4100 to 81,000 lbs.
materials	Nickel, chromium and molybdenum alloy steel and alloy iron.
shapes	Straight, crowned, concaved, taper (for necks)
types	Slabbing, broadside, back-up, hot, cold, sheet, plate.

Controls Convenient for Operator

LANDIS TOOL COMPANY/WAYNESBORO, PENNA.

Take a tip from the

when your construction

This 40 cubic yard Dipper on the Marion Type 5561 Stripping Shovel will scoop up enough earth at one bite to fill a room 10 by 12 by 9 feet. Two dipperfuls would fill a railroad hopper car. If this mammoth shovel were placed in the middle of a typical city block it could reach over into the next block and dump its enormous load on top of a 7-story building.

What is even more amazing is the fact that this 40 cu. yd. dipper was installed on a machine which had formerly been handling a 35 cu. yd. dipper, and yet, even when fully loaded, the bigger dipper does not increase the front end weight.

This was accomplished by careful redesign and the use of new steels of unusually high strength which cleared the way for a dipper and handle design which is 30,000 lb. lighter than materials formerly used in achieving the same strength.

World's Biggest Dipper

requires strength far beyond the ordinary

New, superior-strength alloy steel—tough and readily welded—reduces weight of dipper and handle 30,000 lb. . . . and makes possible a 14% increase in shovel output.

IF you are interested in the possibilities offered by *readily welded* steel plates that have far greater strength and toughness than low-alloy, hot-rolled steels, this story is for you.

Four years ago the engineers of the Marion Power Shovel Company came to us. They had a real problem. They were called upon to design and build a coal stripping shovel of greater capacity than the 35 cu. yd. size—largest in existence at the time—without increasing the front-end weight. What they wanted to know was: could we give them a steel that would have strength considerably beyond that available in the low-alloy, hot-rolled steels?—could it be welded and fabricated by conventional means?—could it be furnished in large plates?—could its cost be kept within economically practical limits?

The answer was "yes." After considerable research and testing, a copper-nickel-molybdenum steel that had been developed for gun mounts during the war was modified to fit the job. This steel has consistently shown a yield point in excess of 80,000 psi and tensile strength in excess of 100,000 psi, and has shown excellent weldability. In addition it has high impact strength, even at sub-zero temperatures. These properties lent themselves readily to Marion design, gave them almost 50% greater strength than obtainable formerly.

The steel was furnished in *heat-treated* plates, ¾" and 1¼" x 64" x 200". Used in the dipper handle in two U-shaped formed sections welded down the center of the sides, it reduced handle weight 25.5%. It was also used in sides and back of the dipper itself, which, although it is 14% larger than the former 35 cu. yd. dipper, weighs 10% less. The steel performed so successfully that it is now being used in *complete* dippers from 10 to 40 cu. yd. capacity.

We have gone into detail on this job because it so aptly illustrates two things:—first, the specialized metallurgical alertness and "know-how" that we can bring to any problem involving the use of alloy steels. And, second, our unequalled mill facilities for rolling, finishing and heat-treating that make it possible for us to supply alloy steel plates, in any analysis—in any size—in any heat treatment, to meet your requirements no matter how exacting. If your job demands the unusual in strength, abrasion resistance, durability, stamina, forming qualities—put it up to Carilloy Research.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO,
PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
SOUTHERN DISTRIBUTORS
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE
DISTRIBUTORS, COAST TO COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH
COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

USS

UNITED STATES STEEL

LINK-BELT—A GOOD NAME ON BALL AND ROLLER BEARINGS

A *good name* is one of man's proudest possessions. A *good name* is also a manufacturer's requisite to stay in business.

For three-quarters of a century, the name "LINK-BELT" has warranted the respect of industry. When you see that name on bearings, you can be sure that the quality is RIGHT. And once you use Link-Belt Bearings, you'll add *your good name* to the names of others who agree that Link-Belt is definitely a *good name* on ball and roller bearings.

LINK-BELT COMPANY

Indianapolis 6, Chicago 9, Philadelphia 40, Pittsburgh 19, Atlanta, Dallas, Cleveland 13, Minneapolis 5, San Francisco 24, Houston 2, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities

U2101

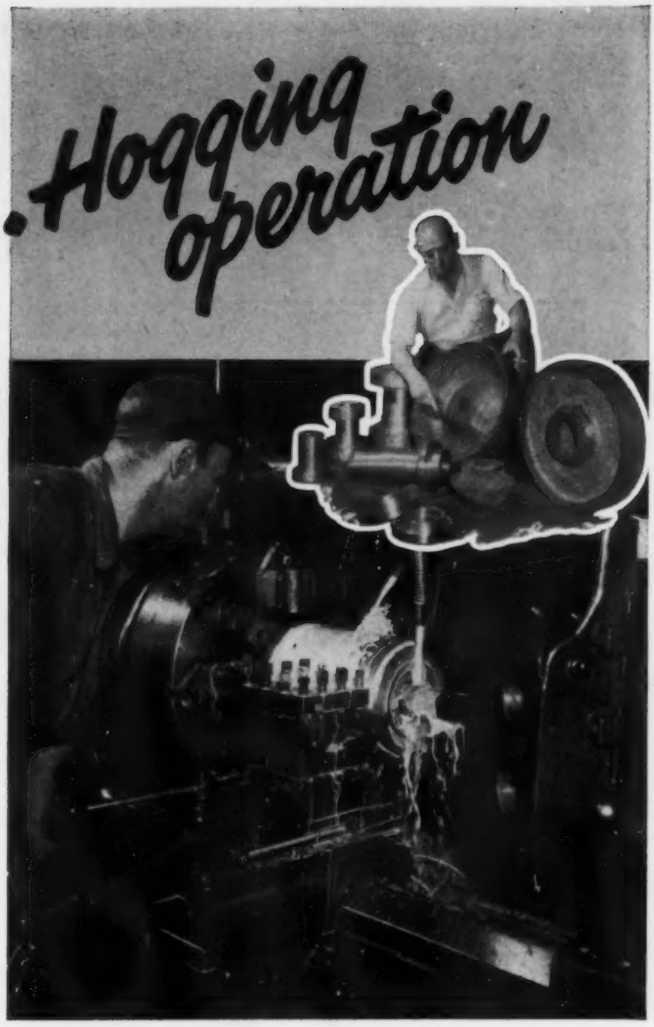
Long life
Inbuilt alignment
Neat appearance
Keen craftsmanship
—
Best performance
Efficient operation
Low cost
Time-tested

THE SYMBOL OF QUALITY · LINK-BELT · LB

Send for Catalogs

A COMPLETE LINE OF MOUNTED AND UNMOUNTED BALL AND ROLLER BEARINGS

LINK-BELT BALL AND ROLLER BEARINGS



You Can Machine it Better, Faster, for Less...

PRECISION is a must at the Sharples Corporation, Philadelphia. They build centrifugal separators. The bowl shells of these separators (see picture top left) weigh 250 lbs. and whirl at the rate of 15,000 r.p.m.!

At 250 revolutions per second it takes tolerances as close as .0005" to prevent these centrifuges from tearing themselves apart. That is why Warner & Swasey 4-A Turret Lathes are used. Their rigidity holds extreme accuracy even on large chucking operations like this one.

This ability to produce highly accurate work has helped many firms earn a reputation for precision products. But precision is not the whole story . . .

HOGGING over 300 cubic inches off a 20-inch steel forging takes power. The Cann & Saul Steel Co., Royersford, Pa., does this. They rough machine parts like this massive propeller hub for industrial blowers (see picture above right) in heavy slab facing cuts that remove nearly half the original steel.

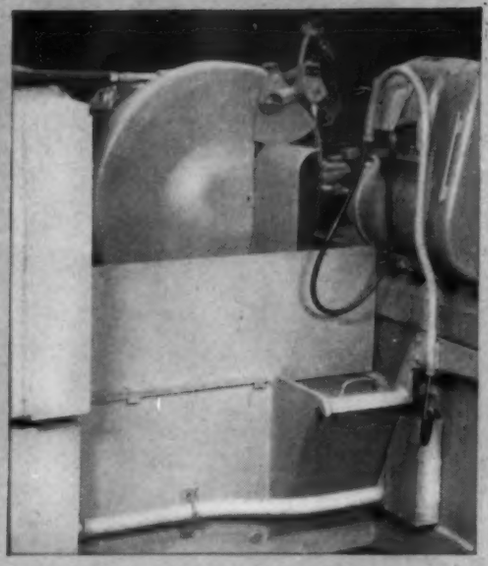
Cann & Saul use Warner & Swasey 4-A Turret Lathes for this gruelling work because they do the job faster and stand up better than any other turret lathes of comparable size.
You get both precision *and* power . . .

...with a Warner & Swasey

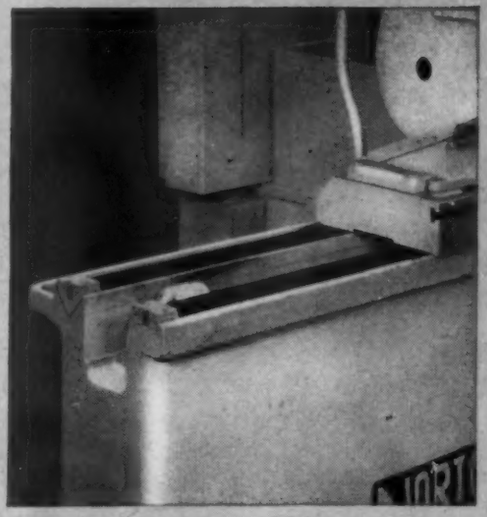
WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

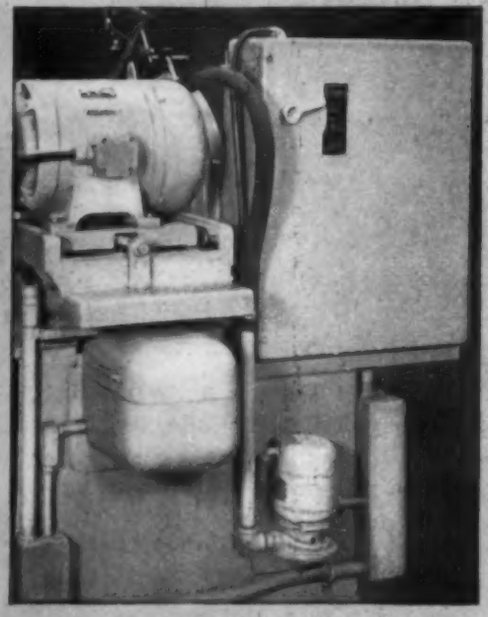
Here are the NEW features production men like



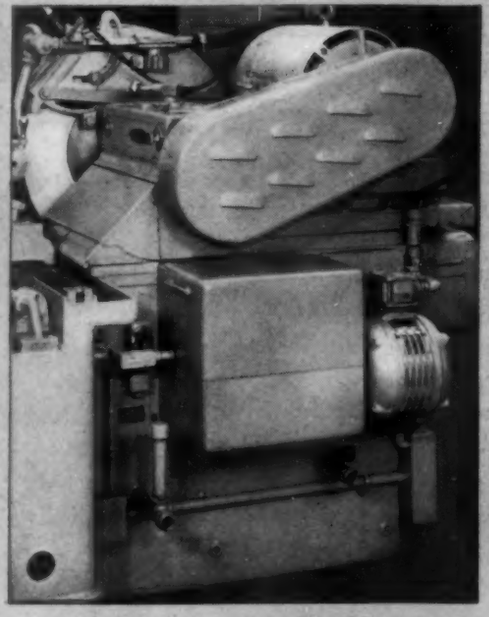
Rear base design offers maximum accessibility to hinged guard for wheel change. Note ramped outlet for easy sludge removal.



Steel ribbon type guards provide complete protection of base ways and reduce grit infiltration. Neat and compact, they require no extra floor space, and allow a more rigid table design.



Electrical equipment servicing made easy. Major controls located in elevated, accessible cabinet. Note rigid conduit.



Pumps and motors mounted outside base to insure convenience and minimum time consumption in maintenance and service.

...in the NORTON TYPE CTU CYLINDRICAL GRINDERS

FINE all around service — whether on high production, or on job lot runs — is delivered by the new NORTON type CTU 6" and 10" Cylindrical Grinding Machines.

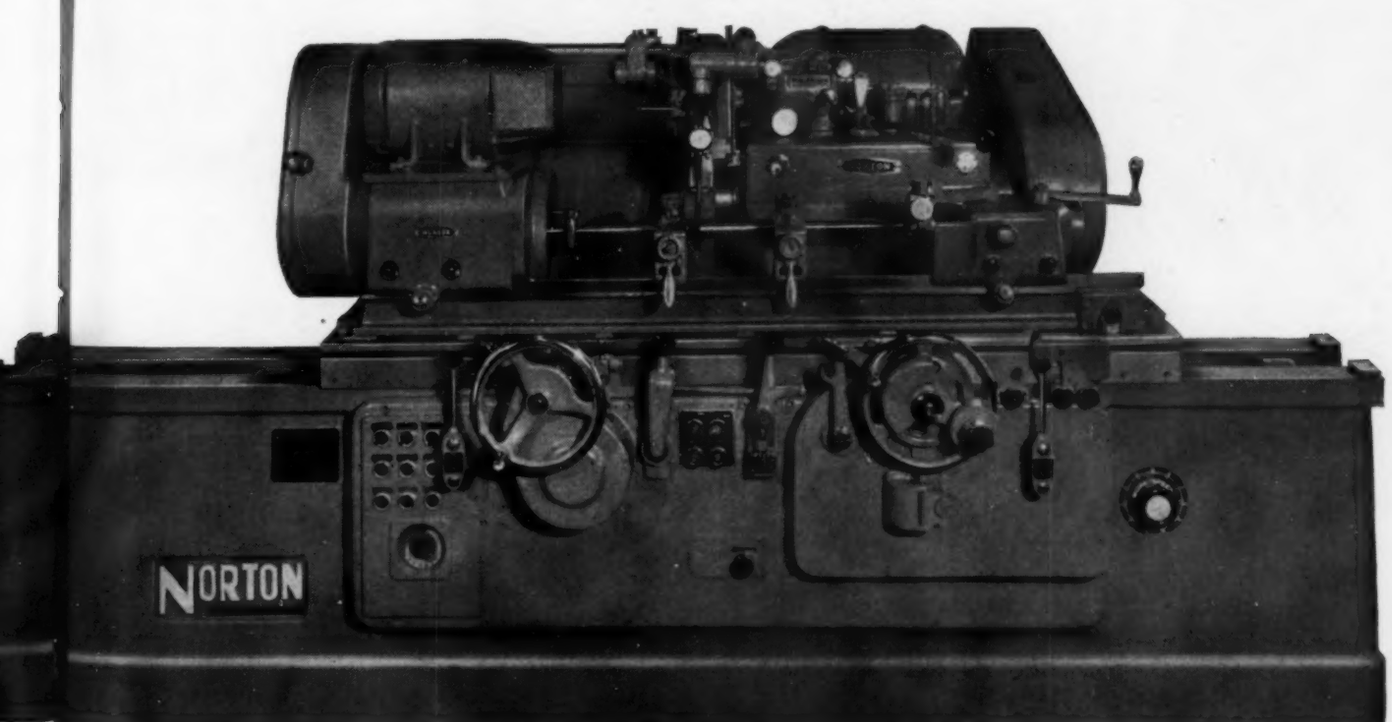
They have increased rigidity through new features in design. This rigidity fortifies their unique ability to stand up under heavy service. It also prolongs the fine quality of precision they offer.

Easy loading, the many new features described on the opposite page, plus new flexibility and the scientific positioning of controls, all make for greater operating ease, and for the very important factors of low work and maintenance costs.

NORTON COMPANY, WORCESTER 6, MASS.

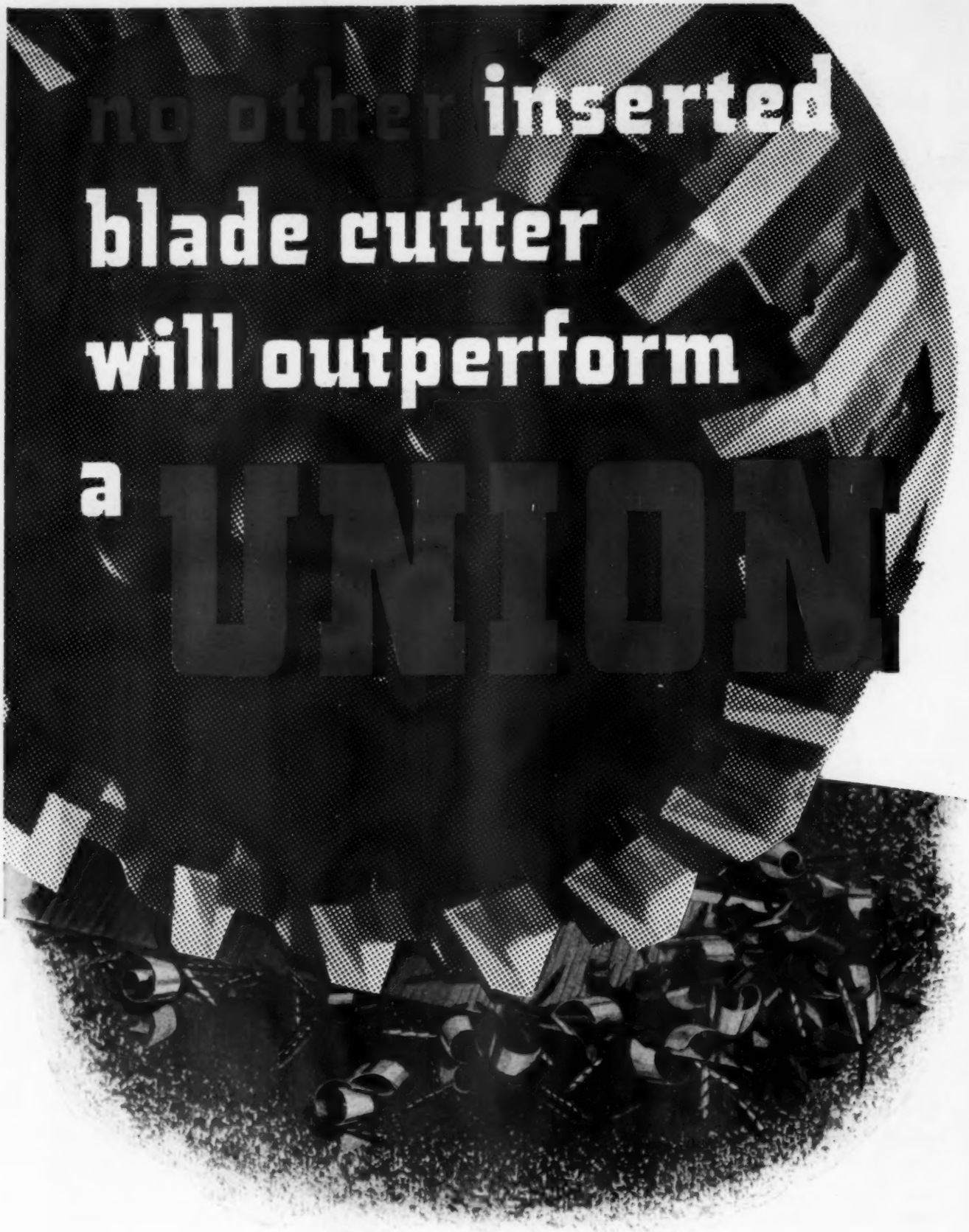
New York - Chicago - Detroit - Cleveland - Hartford

Distributors in All Principal Cities



The NORTON 10" x 36" Type CTU Semiautomatic Cylindrical Grinder

NORTON GRINDERS and Lappers



contact your local distributor

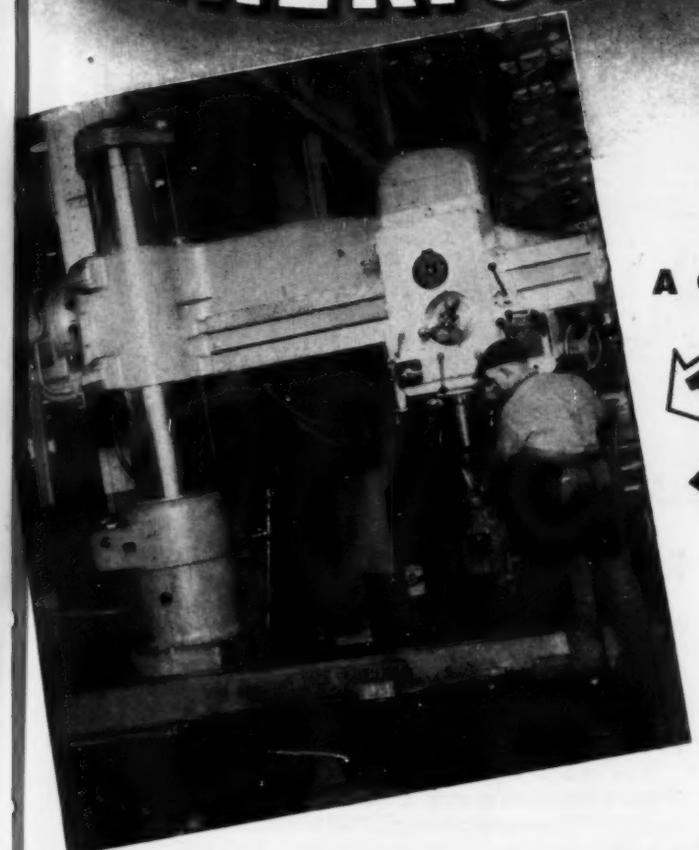
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO., Division, Mansfield, Mass.
BUTTERFIELD Divisions, Derby Line, Vt., Rock Island, Quebec. Manufacturers of Taps, Dies, Screw Plates.

"AMERICAN" Versatility

An Asset in the Railroad Shop!



A QUICK CHANGE FROM

THIS

...toTHIS

This "American" Hole Wizard Radial in the C. & O. R. R. Shops at Huntington, W. Va., seems to be a "jack of all trades."

As shown by the accompanying illustrations, one minute it's reaming cross head fits, the next it's on an emergency job drilling ¾" holes.

The Hole Wizard's wide range of speeds, its concentration of all controls at the head, its patented Double Lo-Hung Spindle Drive, great power and rigidity make it an outstanding machine for both production jobs and miscellaneous work of various kinds.

THE "AMERICAN" HOLE WIZARD IS A BULWARK OF PRODUCTION IN THE SHOP.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

NEW! TERRIFIC!

BWH

DEPENDABLE RUGGEDNESS

presents a complete line of

Bull Dog V-Belts

designed to do your job better!

Fractional Horsepower (FHP) V-Belts in Three Standard Sections. Full Range of Lengths

Industrial V-Belts in A, B, C, D, and E Sections. Full Range of Lengths

READ WHY BULL DOG V-BELTS MEAN

"MORE POWER TO YOU"

Although these V-Belts are now offered on the general market for the first time, they represent years of grueling behind-the-scenes testing.

Ten years ago, BWH technologists perfected V-Belts that performed brilliantly in all laboratory tests. But that wasn't enough. BWH distributors were asked to pick jobs that were "Jonahs". And Bull Dog V-Belts were put through their paces in these tough spots, where other good belts hadn't been able to stand the gaff.

Time after time, Bull Dog V-Belts proved by actual long, trouble-free service that their improved construction means MORE POWER TO YOU on all types of installations!

BULL DOG V-BELTS HAVE THESE OUTSTANDING ADVANTAGES

1. *Exclusive Bull Dog Cord Section with Higher Tensile Strength* — able to carry the load and absorb sudden shocks.
2. *Low Stretch* — because Bull Dog Cords are processed in a new way. This means less slippage, fewer adjustments, longer belt life.
3. *Cool Running* — quality-controlled compounds developed in BWH laboratories don't crack or deteriorate under severe flexing.
4. *Wear-Resistant Covers* — made of bias-cut heavy fabric to protect the heart of the belt from dirt, grease, moisture.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

PLANT: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

RUGGED OIL FIELD TEST PROVES

Bull Dog V-Belts

CAN TAKE IT!

"Best belts I ever used!" said the farm boss. "They're perfectly matched."

There couldn't be a tougher proving ground for V-Belts than a steady daily grind in the Oklahoma oil fields. So BWH welcomed the opportunity to give its new V-Belts a workout there, where operating conditions are really rugged.

In December, 1939, the Amerada Petroleum Corporation installed a set of seven D330 matched Bull Dog V-Belts on one of its wells at Seminole, Oklahoma.

The farm boss watched them at work and prophesied they would give outstanding service. He was right. This set of Bull Dog V-Belts stayed on the job for *six years, eight months and seven days!*

That's an astounding record, particularly since a previous set of belts, made by another manufacturer, had to be replaced after working a little over one month under identical operating conditions.

Ask your nearest BWH distributor about both Fractional and Industrial Bull Dog V-Belts. They're made to the high standards that for 70 years have made the name BWH synonymous with extra service in industrial rubber products.

SPECIFY BULL DOG V-BELTS FOR

"MORE POWER TO YOU"

Bring us your toughest problems. We're specialists in solving them. And remember, whatever your needs in industrial rubber, you can count on BWH products for dependable ruggedness, BWH distributors for dependable service.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

PLANT: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

When you stop "seeing double" in your INSPECTION METHODS —you save time and money!

Grinding and inspecting — then regrinding and re-inspecting — these are no longer the order of the day. Touch-and-go inspection methods, based on *feeling for dimensions*, are out.

The up-to-date prescription is: Dial Indicator Gages. See what you're doing; make the work come right, the first time through! There is a type of Dial Indicator Gage adaptable to the measurement of any dimension — inside or out, parallel, round or tapered. With this type of gaging — Visible Gaging — you get tangible, money-saving reductions in seconds and scrap.

It pays to stop "seeing double" . . . to stop giving standardized parts those unnecessary, doubled operations that put costs into the unjustified "custom-built" class. You rely on dial faces to tell time, speed, pressure — instantly and accurately. Put this same convenience to work on your gaging problems — and start saving money.

Your work may require fine or coarse tolerances. Dial Indicators tell you accurately whatever you need to know. They tell exactly which way the piece is off — and exactly how much. And equally important — *they save time.*

Two types of Dial Indicator Gages are briefly described on the opposite page. Many other types are available. We make Dial Indicators and Dial Indicator Gages — both regular and custom-built — to meet the needs of users in hundreds of industries. For highly specialized needs, we also make Air Gages and Automatic Electronic Sorting Gages. Our collective experience is available to you — through the Federal Field Representative in your territory or direct from our design department and factory. You may save both time and money by calling upon this experience.

FEDERAL
FEDERAL PRODUCTS CORPORATION

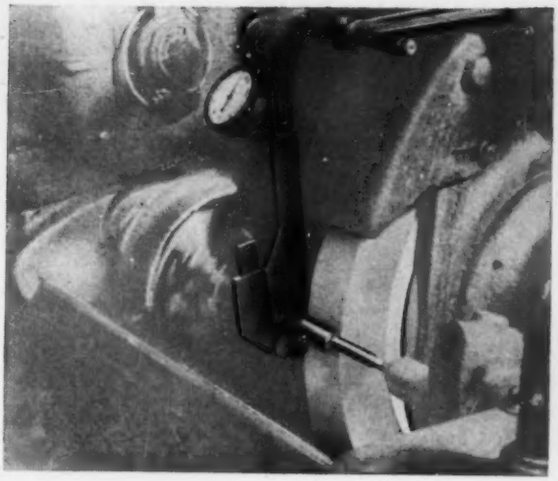
YOUR PROFIT DECISION IS *Visible** PRECISION

*The use of Dial Indicator Gages — visible precision — lowers inspection costs, raises production. Federal Products Corporation is America's largest maker of both regular and custom-built gages — mechanical, air, electronic — for the measurement of single and multiple dimensions.

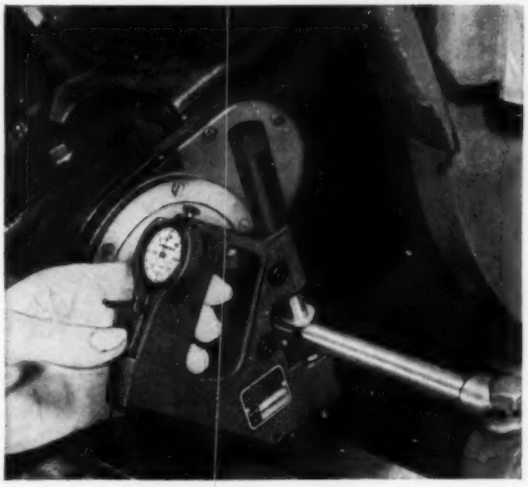
HERE—for example

THE DIAL INDICATOR

permits gaging while grinding



The Arnold Gage makes possible continuous precision measurement without stopping the machine. This prevents out-of-round, oversize regrinds and undersize rejects — reduces inspection time — saves the time formerly needed for stopping to "mike" or gage. The Arnold Gage, with various accessories, accurately gages outside diameter, inside or outside widths between faces of shoulders, tapered diameters, and work having splines and keyways.



Another application

THE DIAL INDICATOR

accurately measures outside diameters

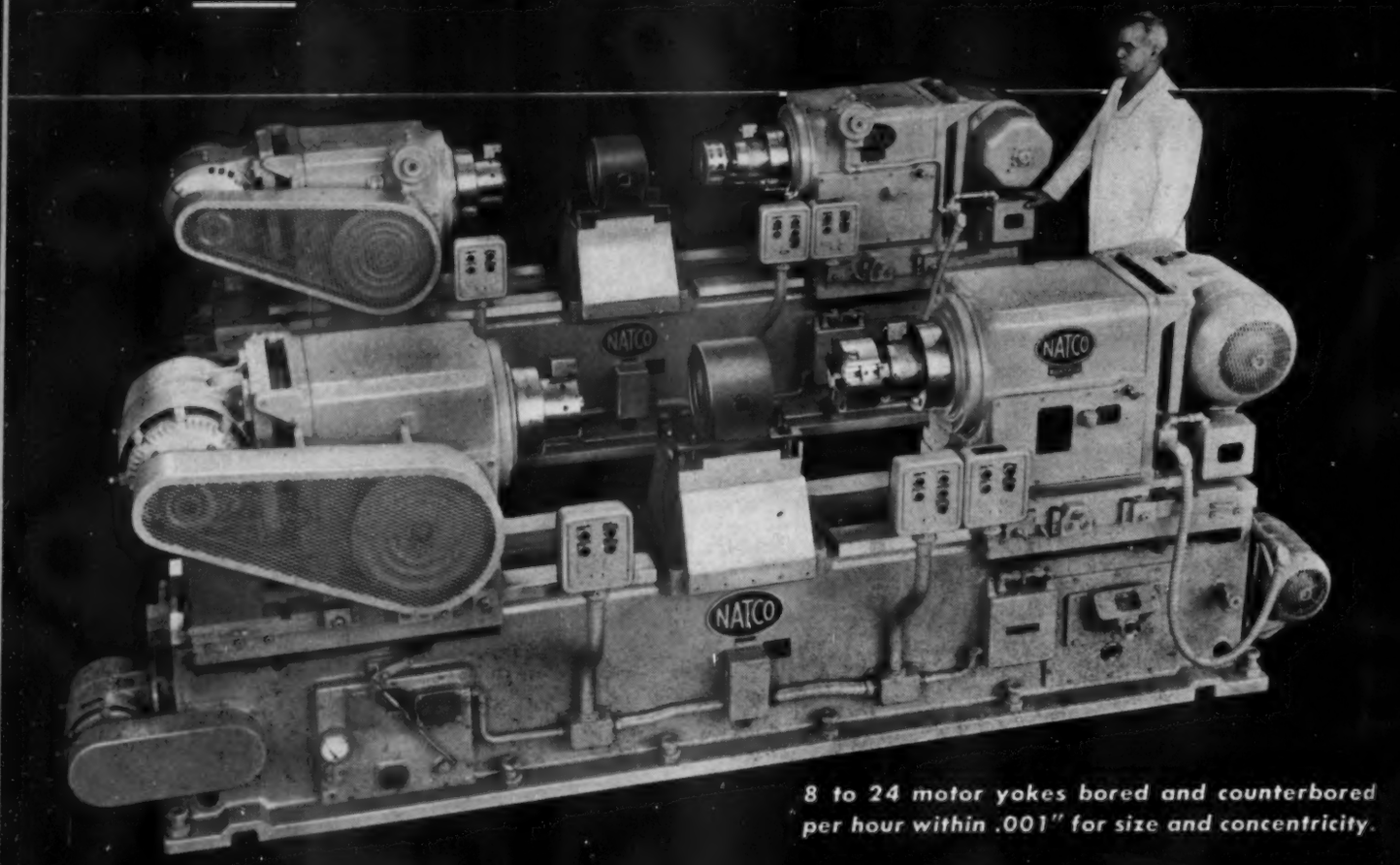
Here is a lightweight gage of the snap gage type, for the accurate measurement of outside diameters. The workpieces can be measured at the bench or while still set up in the machine. This gage is convenient, easily handled. The sensitive reference anvil is retracted by a thumb button; the Dial Indicator is graduated to .0001". You can *see* what you are doing. The narrow width of the gage permits measurements against shoulders and in recesses.

Write for illustrated Bulletin #34 to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

FEDERAL PRODUCTS CORPORATION **1144 Eddy St., Providence 1, R. I.**

Represented in Canada by RUDEL MACHINERY COMPANY, LTD.

How new NATCO BORFACE Unit Machines. . .pr



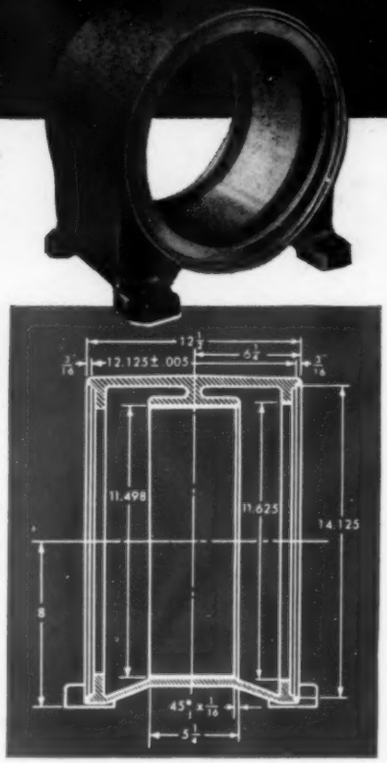
8 to 24 motor yokes bored and counterbored per hour within .001" for size and concentricity.

Example 1 *for an electric motor manufacturer*

The newly developed NATCO A20A BORFACE Units make possible multi-way type precision boring and permit for the first time the rapid production of accurate bores in large hard-to-handle castings by semi-skilled operators.

The two BORFACE machines above were built for an electric motor manufacturer and are arranged for rough and finish boring a range of 8 sizes of cast iron N.E.M.A. frame motor yokes having a minimum central bore of 7" to 11½" diameter with counterbore varying from 9¼" to 14⅛" diameter. Depth of counterbore is 3/16".

Machine in the foreground is constructed of 2 model A20A BORFACE Units for rough boring and counterboring using AC drive motors for the spindles, and machine in background is a duplicate except it is driven by DC motors to permit variable speed in a wide range for maximum cutting efficiency and fine finish in final bore and counterbore operations held to limits of ±.001".

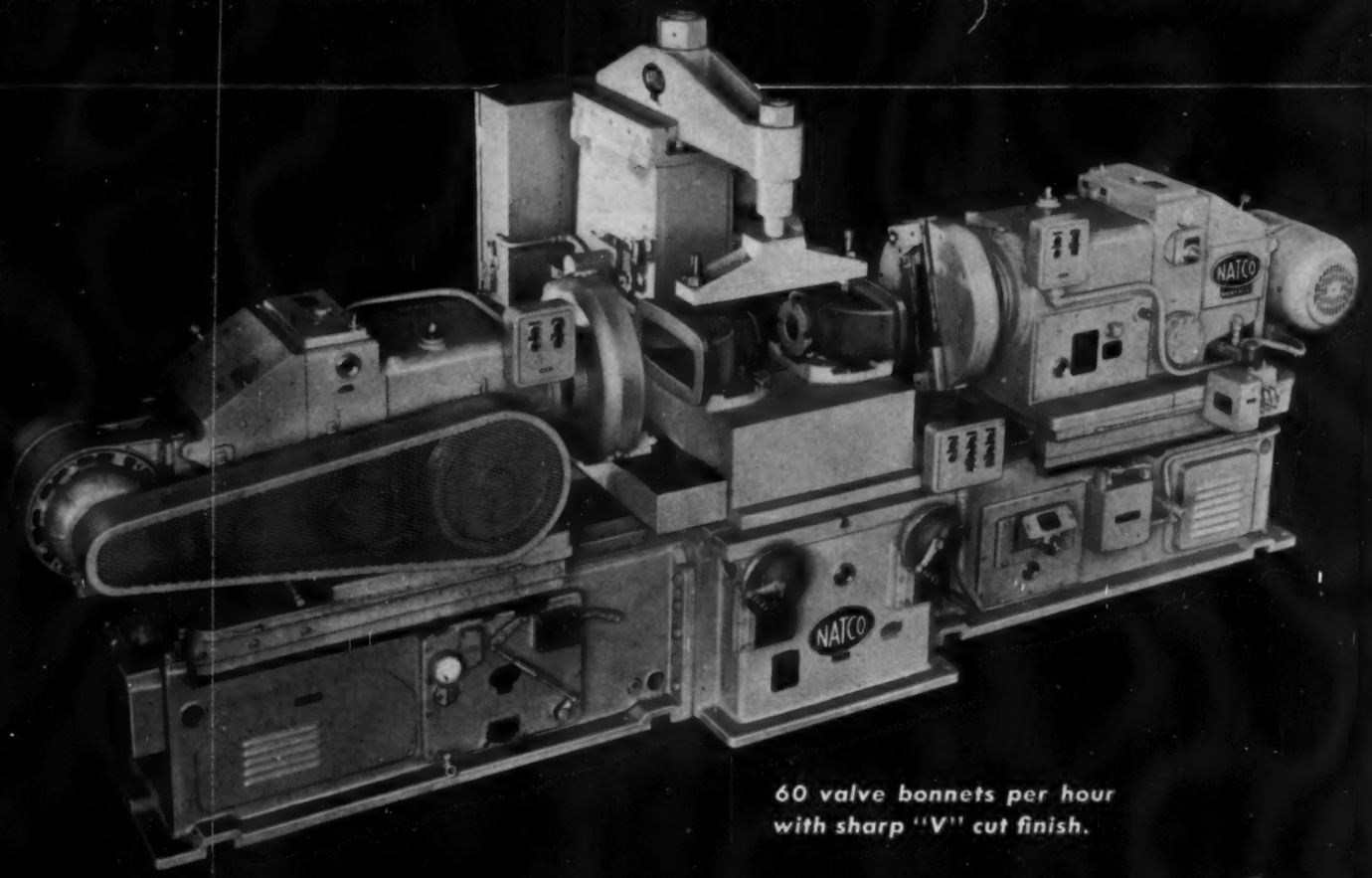


JUST OFF THE PRESS

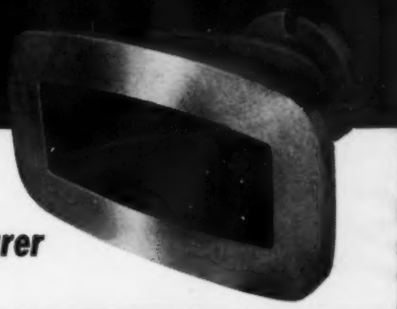
Write Today for your Colorful New **FREE** *Booklet!*

The complete story of these newly perfected BORFACE unit machines is now ready for immediate distribution in complete illustrated form. Write NATCO, Department A, Richmond, Ind.

S. .precision turn, bore and face large, cumbersome parts faster, better



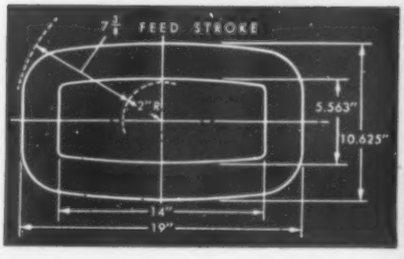
60 valve bonnets per hour with sharp "V" cut finish.



Example 2 for a valve and fitting manufacturer

NATCO A20B BORFACE Units provide the same spindle construction as the A20A machine except for the cross facing drive and control unit. On the BORFACE machine shown here a two-way operation has been provided for a prominent manufacturer of valves and fittings which permits facing 2 bonnets simultaneously. This operation calls for a machine that can cut a flat surface with "phonograph" finish so as to bite into gaskets and hold under pressure. The application of NATCO automatic clamping makes possible faster loading and unloading of awkward parts and eliminates the large cumbersome revolving cradle type fixtures usually found on other machines attempting this work.

Investigate this type of equipment where work is large and awkward to handle or swing on boring mills and lathes.



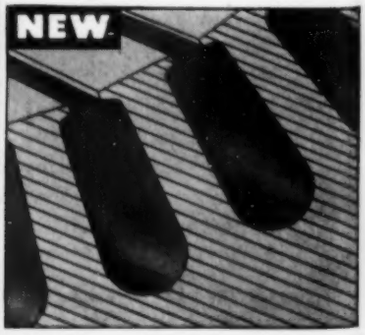
NATCO DRILLING, BORING AND TAPPING MACHINES

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND., U. S. A. • *Branch Offices:* 1809 Engineering Building, Chicago • 409 New Center Building, Detroit • 1807 Elmwood Avenue, Buffalo • 2902 Commerce Building, New York City

Life-Line ..

Usual slot design is rectangular, with sharp corners into which slot cell insulation must be creased and coils must be pushed.



Life-Line slot design is pear-shaped. Coil slips in easily and fills slot—no corner voids remain to collect dirt and moisture.

NEW METHODS . . . NEW MATERIALS . . . OPEN WAY TO LONGER ELECTRIC MOTOR LIFE

An electric motor's "muscle" consists of the "sinews", or coils of wire, packed into slots in the stator of the motor.

If these are "bruised", or cramped or damaged while being put in—or if spaces are left for dirt or moisture to gather—protective insulation breaks down and electrical failures result. *Most motor failures are caused in this way.*

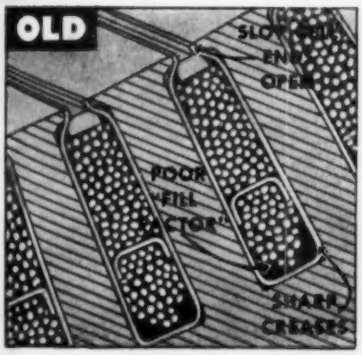
Life-Line—industry's all-steel motor—overcomes these common causes of motor failure. New, pear-shaped slots enable coils to be slipped into place without stress, eliminating need for tapping. No slot corners are left to require creasing of the slot insulation, nor to gather dirt in these voids.

New electrical design is just one of the benefits Life-Line motors bring to builders and users of motor-driven equipment. Get the details on Life-Line's smaller size, lighter weight, greater strength and smoothness.

Life-Line motors, now built in sizes from 1-15 hp, are available from stock in standard and near-standard types. "Specials" in Life-Line design are available on short shipment. Other sizes and types—up to 200 hp—soon will be changed over to modern Life-Line design. Check your nearest Westinghouse office for deliveries—or write or wire today to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

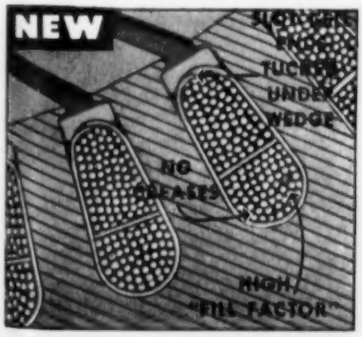
J-21456

Westinghouse PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE *Life-Line motors*



Rectangular slot design leaves many unfilled pockets for dirt, dust and moisture to accumulate and cause deterioration.

Old slot shape frequently required tapping last wires of the coil into position with resulting possible damage or weakening of insulation.



Pockets are eliminated—cell insulation is lapped over and covered by wedge. No sharp creasing of insulation is necessary.

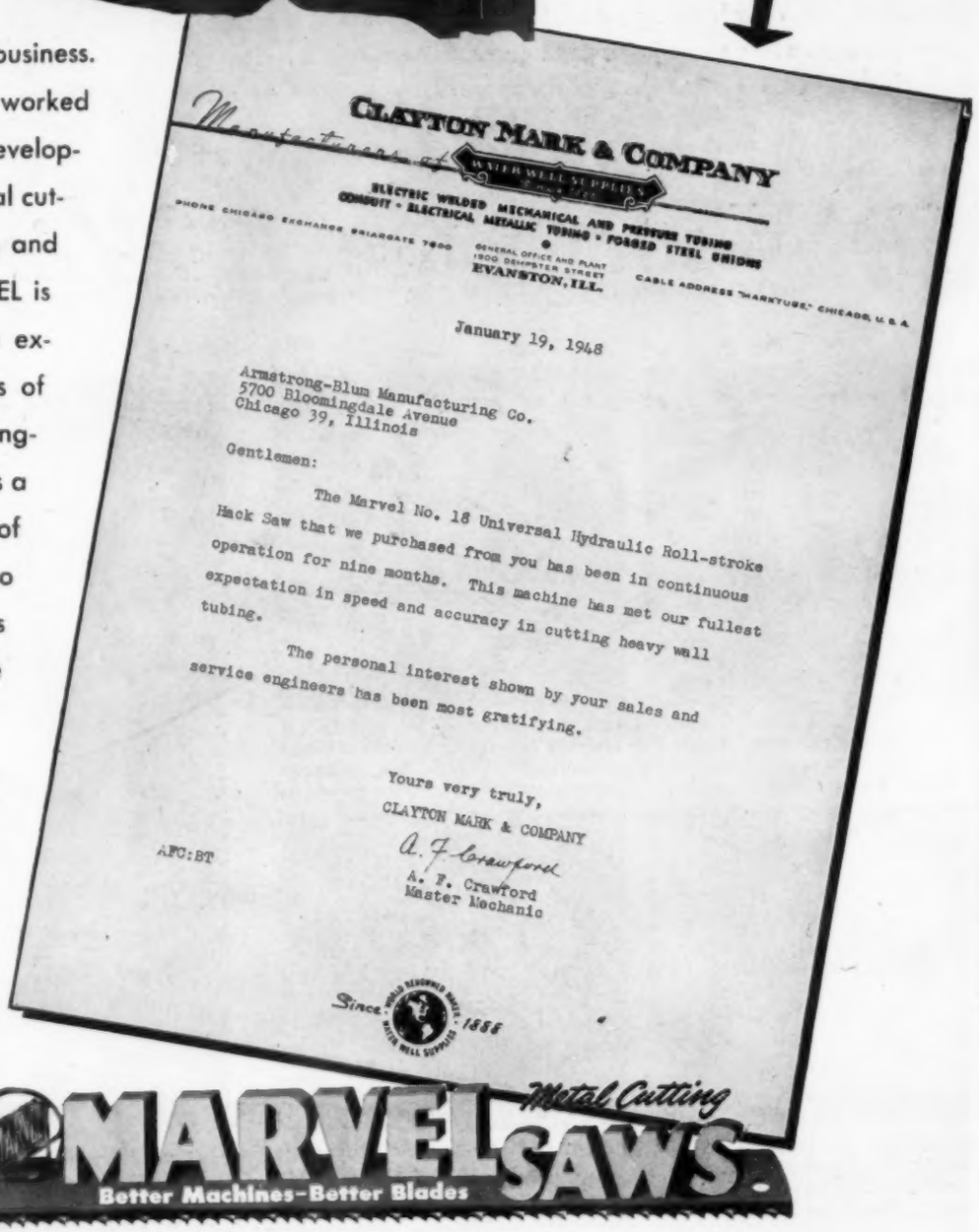
Life-Line "pear-shaped" slots permit coils to be inserted snugly into position without need for tapping or weakening of the insulation.

LONGER LIFE ON THE JOB with freedom from electrical failures is assured by Life-Line motor manufacturing methods and new insulating materials.

You can depend on MARVEL'S 53 years of leadership in both performance and service

Metal sawing is MARVEL'S business. For 53 years MARVEL has worked exclusively on designing, developing and building better metal cutting band saws, hack saws and blades. As a result, MARVEL is uniquely qualified to give expert and unbiased analysis of all metal sawing and cutting-off problems, and maintains a large and competent staff of MARVEL Field Engineers to make this service always and immediately available to you.

Write for Catalog C-48; contains a volume of metal sawing information.



CLAYTON MARK & COMPANY

Manufacturers of WATER WELL SUPPLIES

ELECTRIC WELDED MECHANICAL AND PRESSURE TUBING
CONDUIT • ELECTRICAL METALLIC TUBING • FORGED STEEL UNIONS

PHONE CHICAGO EXCHANGE BRIARGATE 7400 — GENERAL OFFICE AND PLANT 1900 DEMPSTER STREET EVANSTON, ILL. — CABLE ADDRESS "MARKTUBE" CHICAGO, U. S. A.

January 19, 1948

Armstrong-Blum Manufacturing Co.
5700 Bloomingdale Avenue
Chicago 39, Illinois

Gentlemen:

The Marvel No. 18 Universal Hydraulic Roll-stroke Hack Saw that we purchased from you has been in continuous operation for nine months. This machine has met our fullest expectation in speed and accuracy in cutting heavy wall tubing.

The personal interest shown by your sales and service engineers has been most gratifying.

Yours very truly,
CLAYTON MARK & COMPANY
A. F. Crawford
A. F. Crawford
Master Mechanic

AFC:BT

Since 1888

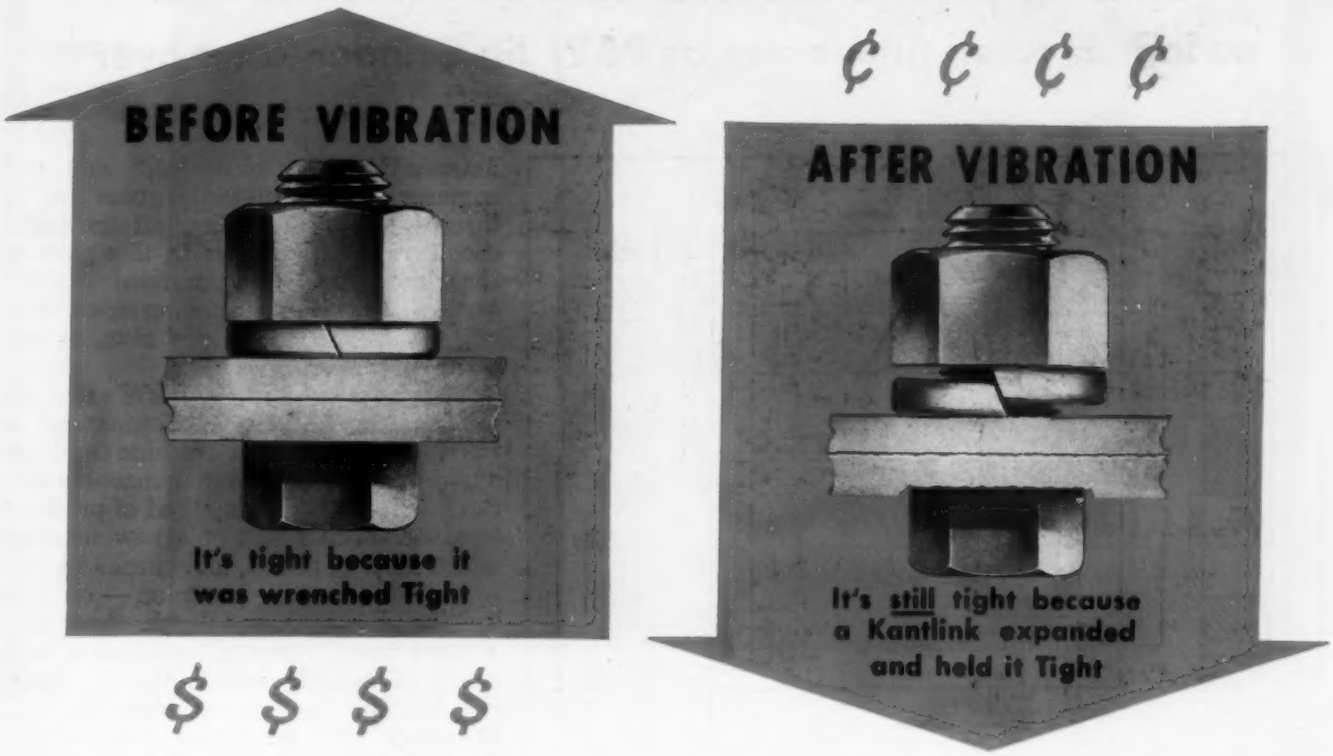
ARMSTRONG-BLUM MFG. COMPANY

5700 loomingdale Ave.
Chicago 39, U.S.A.

Metal Cutting **MARVEL SAWS**

Better Machines-Better Blades

Spend a few cents . . .


¢ ¢ ¢ ¢
BEFORE VIBRATION
It's tight because it was wrenched Tight
AFTER VIBRATION
It's still tight because a Kantlink expanded and held it Tight
$ $ $ $

save many dollars!

In designing *any* machine *or* mechanism *or* product in which there are *bolted assemblies* specify *spring washers* – to *insure tightness under vibration. Looseness costs money.*

And if you overlooked these safety devices when you designed – *redesign* now. It always *pays* to use powerful, long-range Kantlink Spring Washers. They *maintain* the *pressure* you put on your bolted assemblies.

Remember, nuts don't turn on their bolts while there is pressure on the threads. *Other* parts of your assemblies will wear loose inevitably; and that's when the live spring Kantlinks expand to hold *all* parts tight longer. The powerful expansion of live spring Kantlinks under the wear of vibration saves countless dollars that would otherwise loosen and rattle away.

There is no substitute for a spring washer. Write today for descriptive folder.

Originators of KANTLINK the long-range spring washer

THE NATIONAL LOCK WASHER COMPANY

Newark 5, New Jersey — Milwaukee 2, Wisconsin

New Toolroom Technique

Grinding precision-spaced holes in hardened steel no longer rated time-eater as P&W Jig Grinder takes over

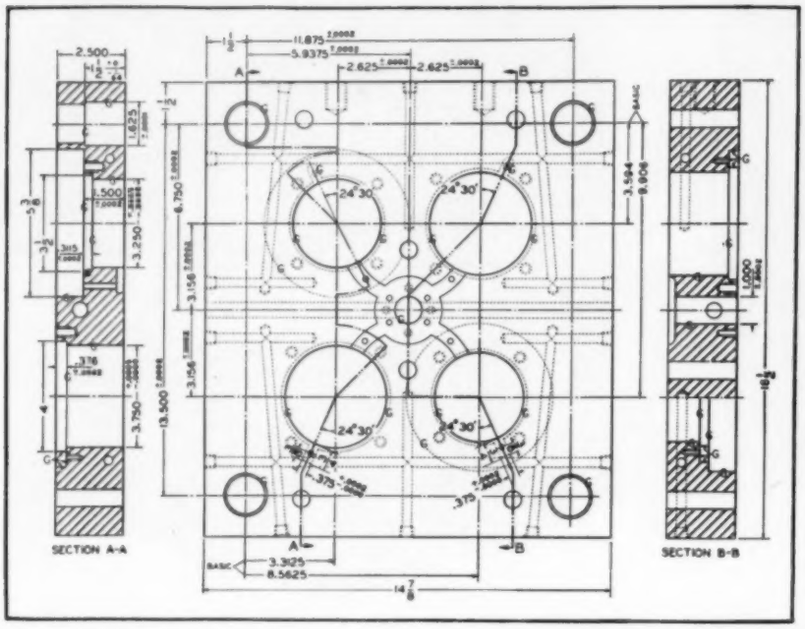


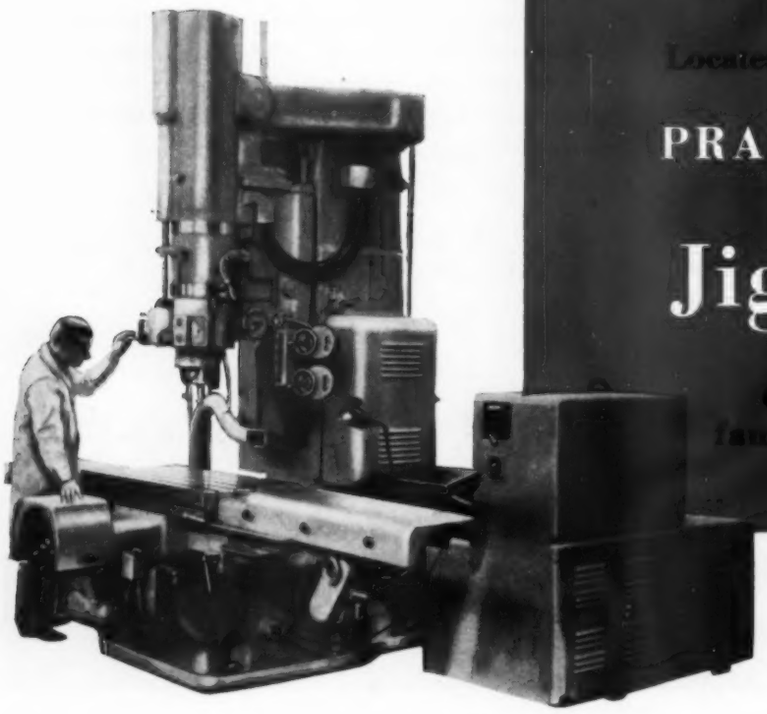
Diagram shows one-half of a hardened die casting adapter made for Veeder-Root, Inc., long famed for its precision die castings. Accurate grinding was essential because sixty different round dies must fit *interchangeably* and accurately into these holes.

Examining this "blueprint," any tool engineer would ordinarily guess two or three weeks for grinding all the holes, shoulders, and key slots in this piece to the close tolerances demanded. *Yet it took only fifty hours (including set-up time) to grind all those holes and slots, in steel hardened to 50 C Rockwell.*

This record was set by P&W's new all-electric Jig Grinder. Companion to P&W's Jig Borer, this machine combines a powerful vertical grinding machine with the P&W Jig Borer's method of precision locating. The result is a new machine which locates, grinds, and checks its own work — to "tenth" precision — on hole spacing, diameter, and depth. And, with a rapid metal removal rate and a wide range of spindle speeds up to 54,000 R.P.M., the Jig Grinder opens the way to many jobs otherwise prohibitively expensive or impossible. It will pay any tool engineer to investigate.

For a complete, illustrated case history of this precision grinding job, write

PRATT & WHITNEY
Division Niles-Bement-Pond Co.
WEST HARTFORD 1, CONNECTICUT



Locates + Grinds ⊙ Checks ⊙

PRATT & WHITNEY

ALL-ELECTRIC

Jig Grinder

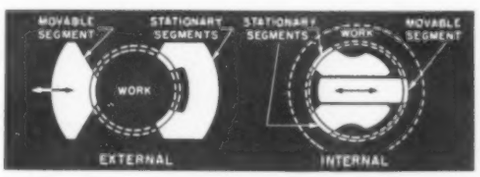
Companion to the famous P&W Jig Borer

"There is no better-paying investment than the right tools for the job"

What's in VERMONT *this month?*

AN ENTIRELY NEW PRINCIPLE SPEEDS THREAD INSPECTION. A new principle of thread inspection has been developed that is *visual*, and so fast as to obsolete most conventional production gaging methods. It is more accurate and, even with inexperienced help, is 8 to 10 times faster than the ring and plug gage system. It eliminates threading and unthreading the part with the gage threads. It shows instantly the size, presence of burrs and out-of-roundness, and the accumulated inaccuracies of pitch, lead, diameter and thread form. It shows variation between production threads and a known master.

This new principle, developed by Bryant Chucking Grinder Co., Springfield, Vermont, employs three ground thread segments — two stationary and one movable by a control lever. To inspect external threads, just squeeze the control lever, drop the part between the three segments, release the lever and give the part a third of a turn — the large dial indicator gives an instant, visual, all-over check of thread accuracy. By again squeezing the lever, the part is lifted out without unthreading. Procedure for internal threads is identical except that part is dropped over the thread segments. Because threading is eliminated, the segments retain their ground-in accuracy over an extremely long life. Further, this feature eliminates taper wear as commonly found on the first few threads of worn ring and plug gages. . . . It won't cost to inquire.



Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.

BRYANT *Thread Gages*

No. 1 External Thread Gage

No. 2 External Adjustable Thread Gage

Universal Diameter Gage for Internal or External Plain Diameters

No. 1 Thread Gage with Squareness-of-Face Gage Attached

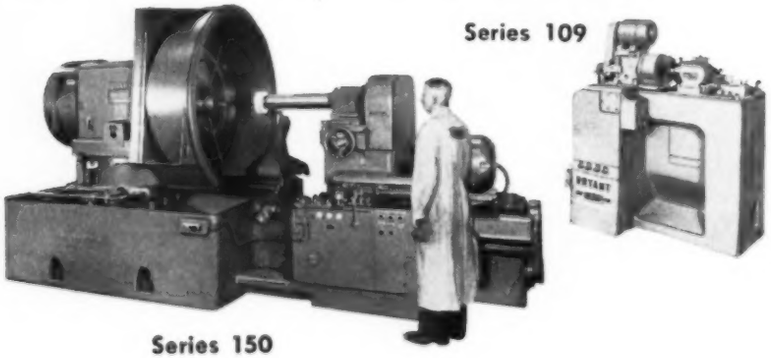
Bryant thread gages, a few of which are shown, are built in many standard and special models to handle the inspection on a wide range of threaded parts. Segments for both external and internal gages are furnished to either GO or NOT GO thread form to "W" tolerances, thus accommodating all classes of fits. Capacities of standard bench models are $\frac{3}{8}$" to 5" internal and $\frac{3}{16}$" to 5" external; portable models are $\frac{7}{16}$" to 3" internal. Write the factory for full information.

3-Flute Tap Gage

Internal Portable Thread Gage

BRYANT

INTERNAL GRINDERS



Series 150

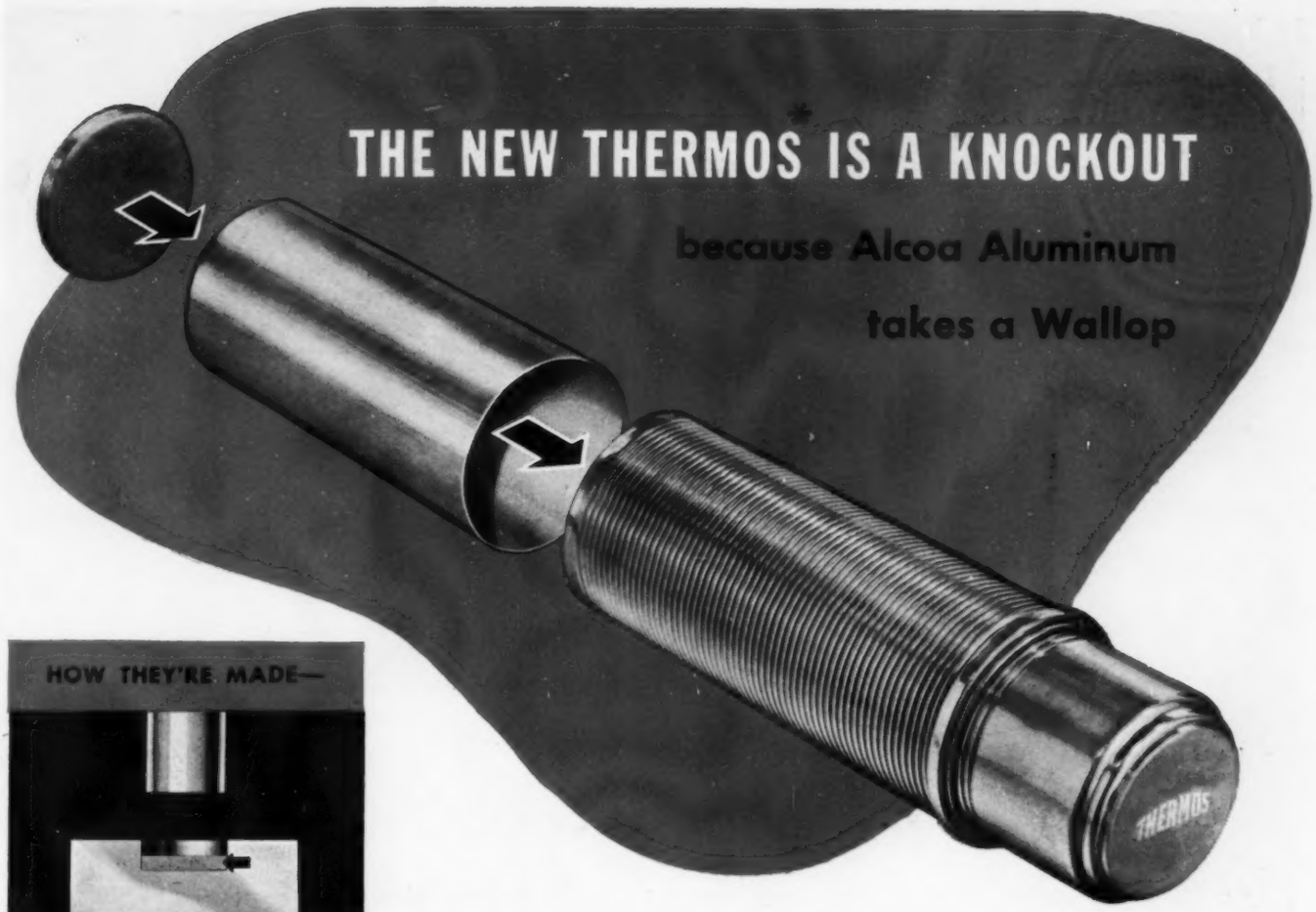
Series 109

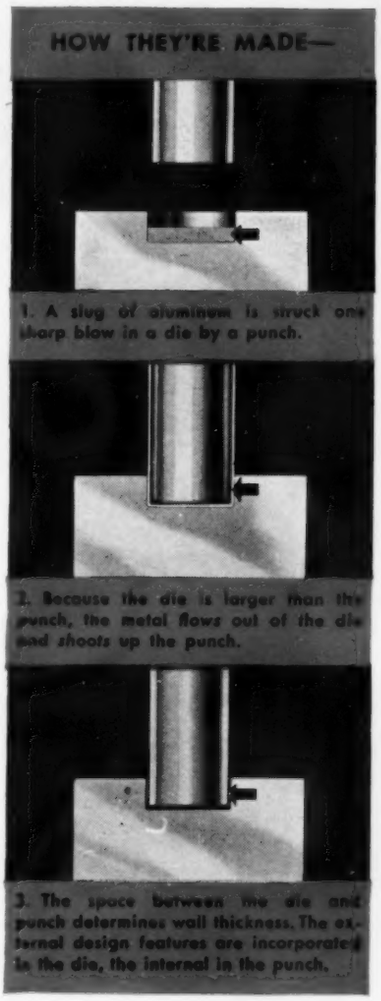
For 38 years Bryant has manufactured precision internal grinders. Today, the complete line covers machines for grinding holes from .040" to 50" in diameter. Standard and special machines will grind straight, tapered, curved and irregular holes, or any of these in combination. Face and hole grinding can be combined to assure squareness. Cams and irregular holes can be ground by using the Bryant cam tooling. Write to the factory for full details.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.

THE NEW THERMOS* IS A KNOCKOUT

because Alcoa Aluminum takes a Wallop




HOW THEY'RE MADE—
1. A slug of aluminum is struck one sharp blow in a die by a punch.
2. Because the die is larger than the punch, the metal flows out of the die and shoots up the punch.
3. The space between the die and punch determines wall thickness. The external design features are incorporated in the die, the internal in the punch.

The shell of the new all-aluminum *Thermos** brand vacuum bottle is an Alcoa Aluminum Impact Extrusion, formed in one mighty wallop from the aluminum alloy biscuit shown above at far left.

By using an Alcoa Aluminum Impact Extrusion, American Thermos Bottle Company gives the new *Thermos* brand bottle these sales advantages . . . higher strength than a stamped or drawn shell, lower unit cost for the shell, lighter weight for the finished bottle, gleaming beauty that will never be marred by rust.

Almost any shape that is symmetrical can be made as an Alcoa Aluminum Impact Extrusion. Bosses, vertical fins, lugs, and other special features are formed integrally at the moment of impact. Few tools are required, and these cost little. Parts costs are less, almost no finish machining is necessary, design possibilities are unlimited.

Let us show you the variety of parts made as Alcoa Aluminum Impact Extrusions. Your designer's imagination will find places to use impact extrusions in your products.

ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in 54 leading cities.

*Trade mark of American Thermos Bottle Co.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM 1888 1948 60 YEARS OF SERVICE

Want to hoot at grinding costs?

Might some of your profits be falling prey to excessive grinding expense? Are your wheel-wear and dressing costs higher than they should be, or your wheel life shorter?

You're afraid they might be?

Then call in a Peninsular engineer. That's the *wise* way to hoot at grinding costs!

Your Peninsular engineer will give your machines and methods, the materials you grind and the finishes you need a thorough analysis.

His recommendations and suggestions to you will be founded on *facts* and first-hand observation. And the wheels he prescribes for your grinding will be individually tailored to fit your needs.

Peninsular engineers have chased down hard-to-find profit leaks in the grinding departments of nearly every field of industry.

When may they put this experience to work for you?

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

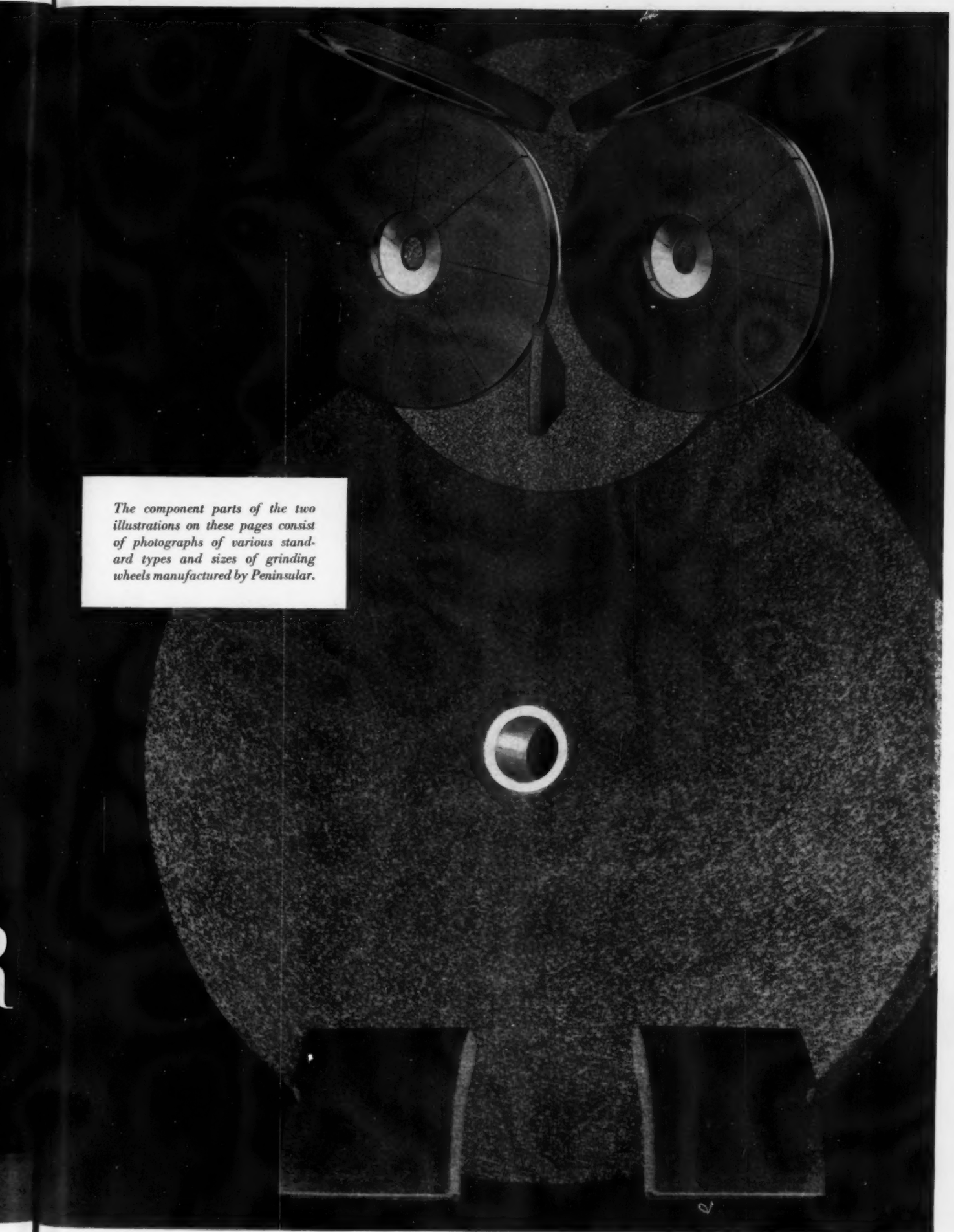
PENINSULAR

INDIVIDUALLY PENINSULAR ENGINEERED

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



The component parts of the two illustrations on these pages consist of photographs of various standard types and sizes of grinding wheels manufactured by Peninsular.

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
How does Grinding and Sanding Efficiency continue to improve?

ANSWER BY
CARBORUNDUM
TRADE MARK

Through a continuing program of research, The Carborundum Company is constantly developing uniform abrasive products. Products that cut faster and cooler, last longer, improve finish and in other ways add to grinding and sanding efficiency.

Accomplishments of this program are well known. To the users of abrasive products they are assurance that abrasives by CARBORUNDUM are in the forefront of technical progress. It is for this reason so many manufacturers, noted for production efficiency, prefer abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

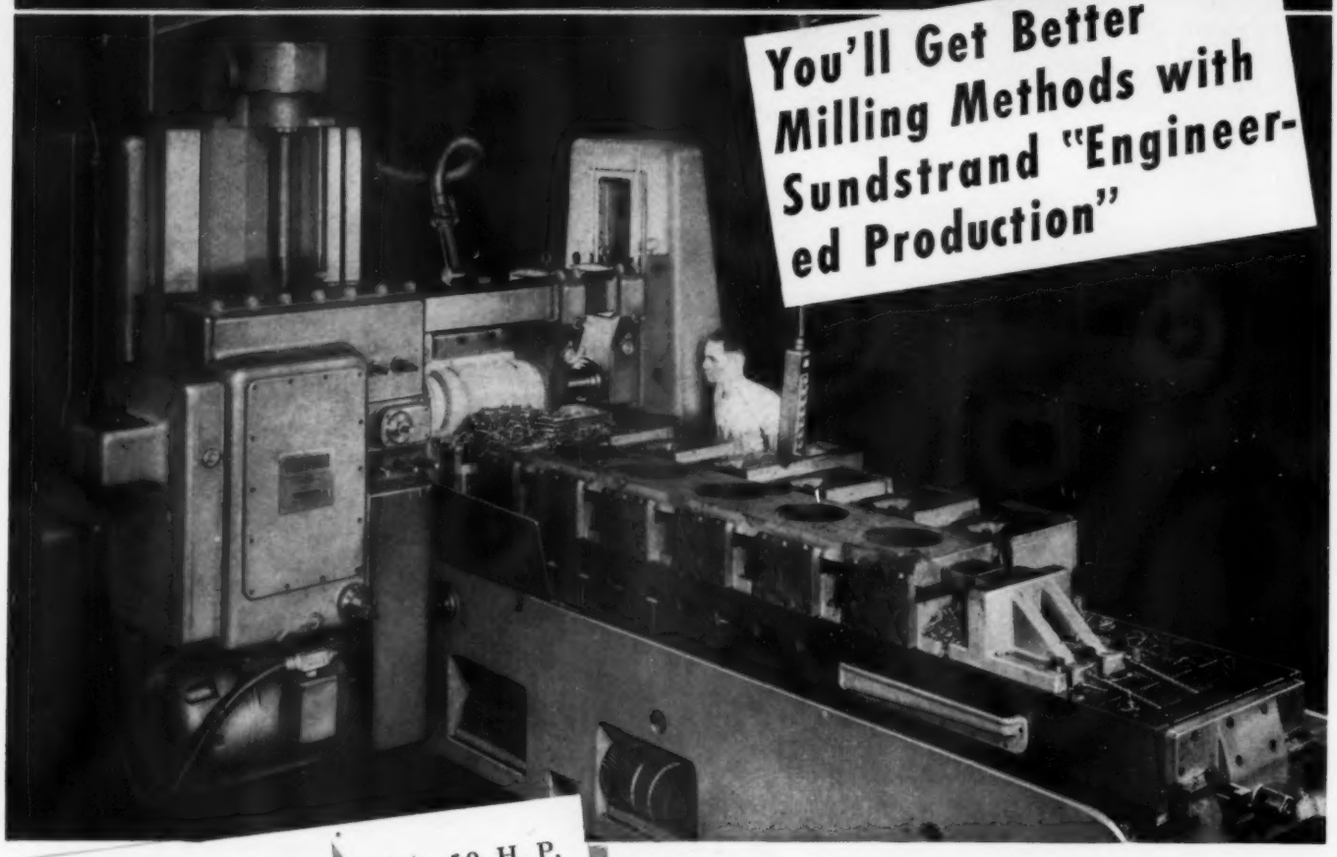
A Good Rule for Good Grinding

Specialized wheels by CARBORUNDUM for thread grinding
Cutting-off wheels . . . the modern tool for faster, less costly, more finished cuts
Cool-cutting GREEN GRIT wheels for cemented carbide
Diamond wheels to meet stiffer technical needs
A coated abrasive for every sanding and finishing condition
All standard shapes are supplied in grinding wheels by CARBORUNDUM

. . . CALL IN **CARBORUNDUM** TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

WHETHER IT'S A BIG JOB OR SMALL— SIMPLE OR COMPLICATED...



You'll Get Better Milling Methods with Sundstrand "Engineered Production"

FOR INSTANCE: This 50 H. P. Sundstrand Model 66 Rigidmil form-mills the top of top decks for diesel locomotive frames. The material is 1020 steel annealed and 288 lb. of metal are removed from each plate. The machine is provided with 40" of power vertical adjustment of the head, 168" longitudinal feed of table, and weighs approximately 78,000 lbs.

Yes, no matter what you are milling or how, it's a good idea to get a periodic check-up from a Sundstrand production engineer. He's primarily concerned with methods and knows that: Profitable milling production can be obtained only by lowering unit production costs . . . obtaining the most economical solution to your milling problem and the most productive milling equipment in relation to your production requirements.

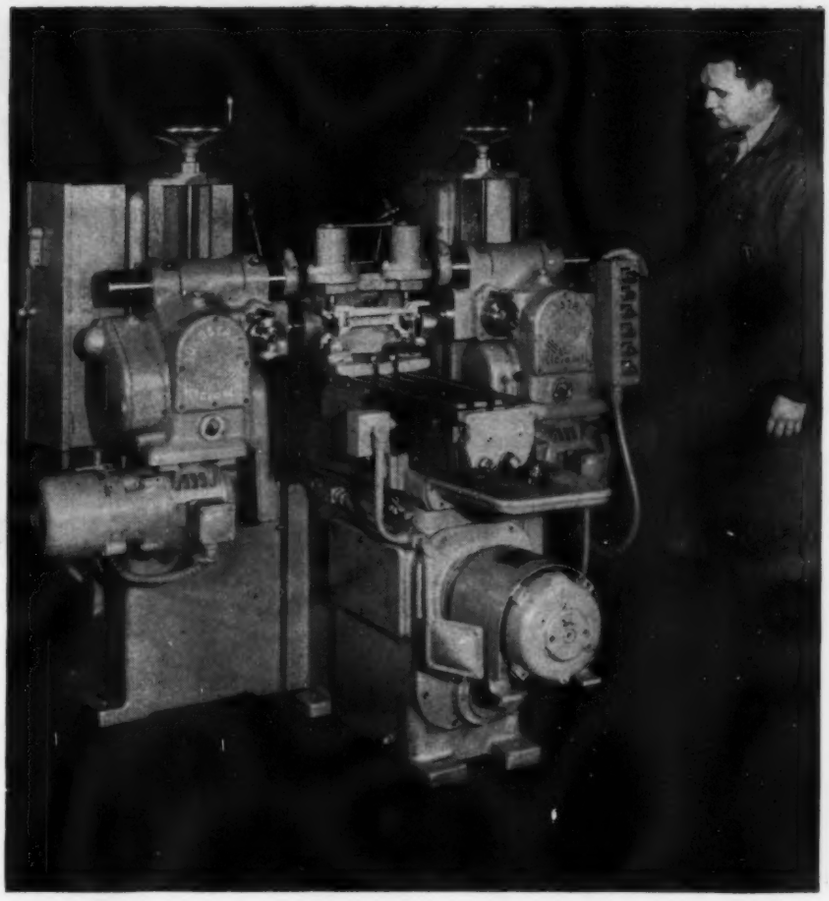
Basically, there are two approaches to solving these problems: (1) Obtaining standard machines, then trying to process parts over these machines as economically as possible. (2) Determining the proper method first, then obtaining machines to suit the method — standard or semi-standard machines, if possible, or entirely special machines if necessary.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

FOR INSTANCE:

This small standard No. 0 Duplex Hydraulic Rigidmil mills both ends of a small aluminum die casting simultanelusly. Part is of an odd shape and fragile which requires careful and uniform clamping pressure. Since the machine is hydraulically actuated, delicate but firm hydraulic clamping was provided from the main source of hydraulic power. Weight is approximately 4700 pounds.

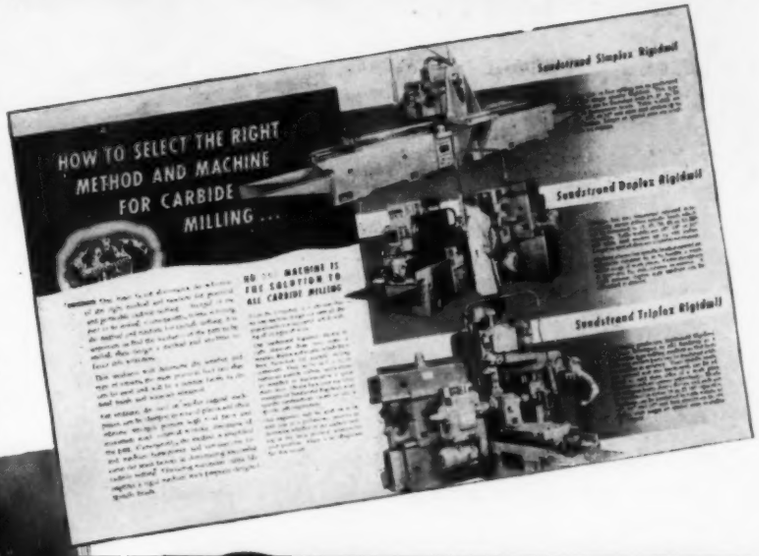


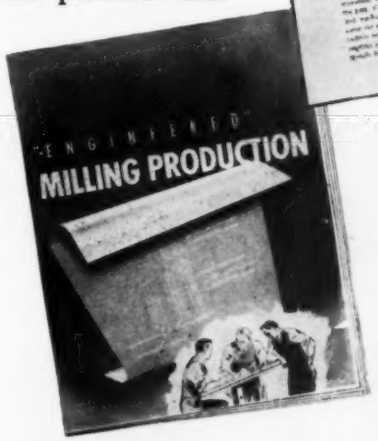
This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling. The two examples shown here illustrate how it has worked out on two entirely different jobs, one big, one small. Perhaps you can effect more savings with an "Engineered Production" analysis. Call in a Sundstrand sales engineer without obligation.

FREE!

helpful information

is provided in these two booklets. One, a milling methods book contains 40 pages of actual job studies. Tooling diagrams and pertinent data are included. The wealth or information contained in this booklet may provide you with a cost-saving idea. The second booklet contains up-to-date information on carbide milling with Sundstrand Simplex, Duplex and Triplex Rigidmils. Write for these books today. Ask for bulletins 172.


HOW TO SELECT THE RIGHT METHOD AND MACHINE FOR CARBIDE MILLING . . .
Sundstrand Simplex Rigidmil
Sundstrand Duplex Rigidmil
Sundstrand Triplex Rigidmil



SUNDSTRAND MACHINE TOOL CO. ANN ARBOR, ILLINOIS, U.S.A.

SUNDSTRAND

MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

ARMSTRONG BROS. TOOL CO.

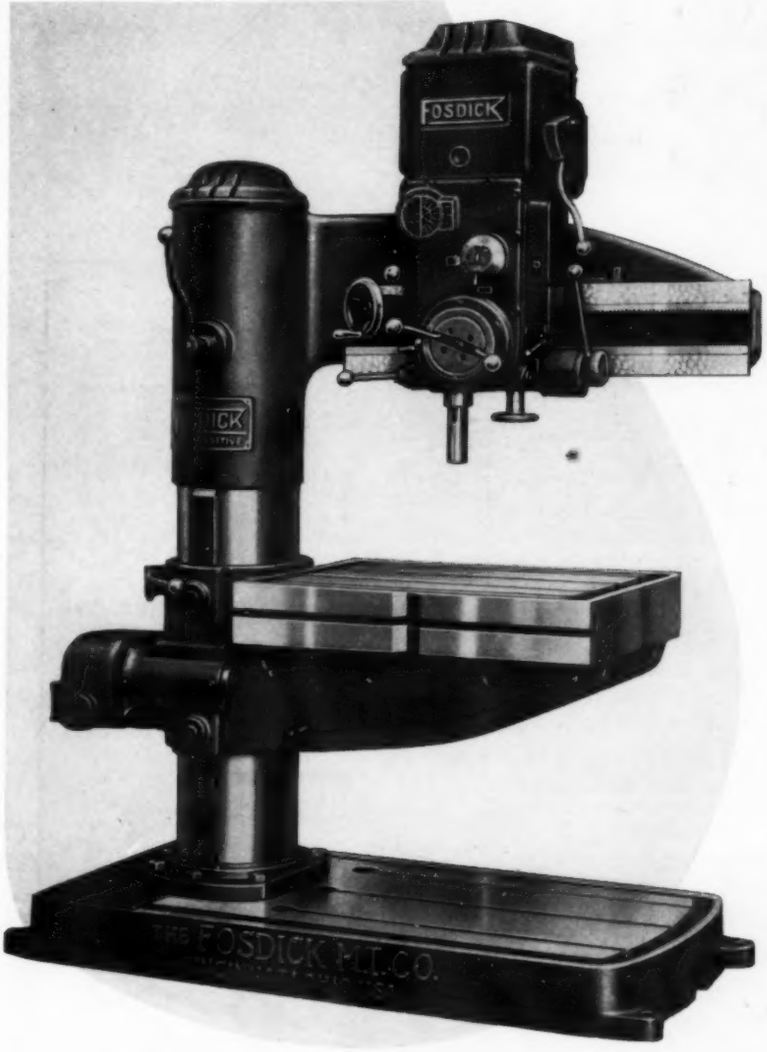
"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

San Francisco and New York

A New Machine with a great future . . . for you

FOSDICK Sensitive RADIAL DRILL



● This recent addition to the Fosdick line of radial drills meets the need for an efficient machine to handle sensitive radial drill work.

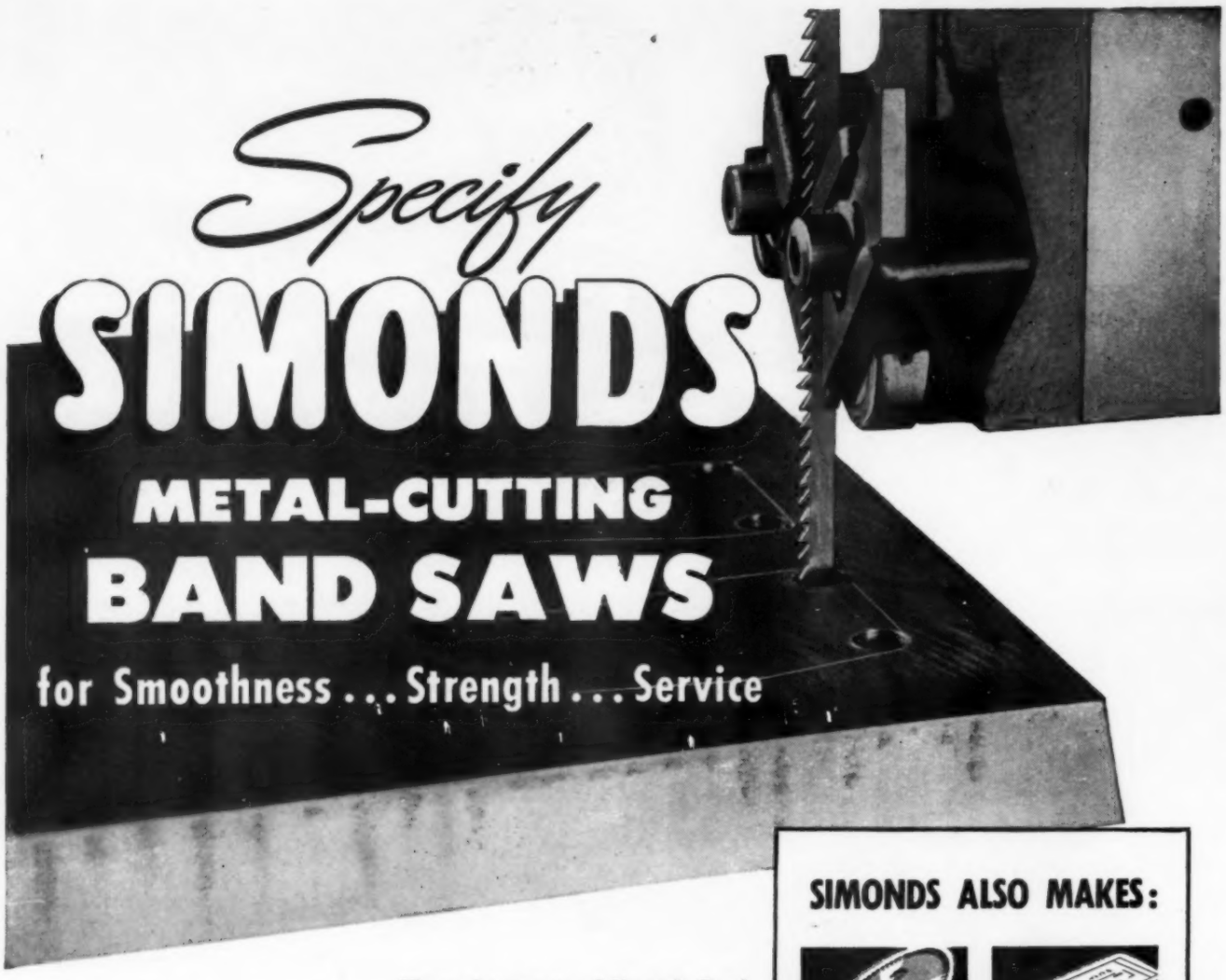
It's new—It's different—this machine has an arm at fixed height and a movable table which can be moved up and down the column. Both table and arm may be swung in an arc of 360°. This design places the table in the proper position for any job suitable for the machine.

The table mounted on the column is raised or lowered either by hand or power. A two-speed ratchet handle, on the right side of the head, provides a more convenient means of hand feeding the spindle. The conventional base is also furnished which can be used for mounting large work.

This entirely new machine offers great possibilities in the field of sensitive drilling. It has a great future in reducing costs on many jobs here-to-fore both difficult and expensive to handle.

Get the details
. . . write for Fosdick Sensitive Radial Bulletin . . . SRA.

FOSDICK MACHINE TOOL Company
CINCINNATI 23, OHIO



Specify SIMONDS METAL-CUTTING BAND SAWS

for Smoothness . . . Strength . . . Service

These three types of Simonds Band Saws . . . made from special Simonds steel . . . with evenly set, milled teeth . . . will do any bandsawing job for you faster and better, at lower cost:

Regular Hard-Edge Band Saws: For speed-cutting alloy steels and other ferrous metals. 8 widths and tooth sizes, for general and contour cutting.

Skip-Tooth Band Saws: For speed-cutting plastics, aluminum, magnesium and other soft, non-ferrous materials which require extra gullet-capacity to clear large chips. 4 widths and tooth sizes.

Spring Temper Band Saws: For speed-cutting thin aluminum sheets, magnesium and steel . . . as well as light structural shapes, plastics, fibre, etc. 7 widths and 5 tooth sizes.

Extra Savings: Don't divert your millers, shapers, lathes and drills to work that Simonds Band Saws can do *better and faster!*

And don't overlook the opportunity to save by making your own gages, templates, etc., from Simonds Flat Ground Steel Stock cut by Simonds Metal Bands . . . a top money-saving combination. Ask your Distributor.

SIMONDS ALSO MAKES:

CIRCULAR METAL-CUTTING SAWS (Solid-Tooth, Inserted-Tooth, Segmental)

FLAT GROUND STEEL STOCK (Oil Hardening)

"RED TANG" FILES

"RED END" HACKSAWS

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS — Special Electric Furnace Steels
SIMONDS — Grinding Wheels and Grains
SIMONDS — Simonds Products for Canada

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

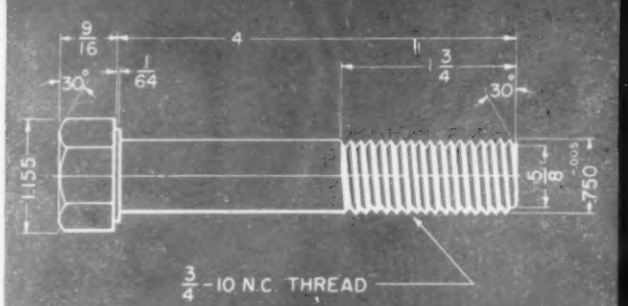
SIMONDS METAL-CUTTING BAND SAWS

REGULAR HARD EDGE . . . SKIP-TOOTH HARD EDGE . . . AND SPRING TENSION SAWS

WHEN YOU USE SIMONDS YOU STAY IN THE HIGHLANDS . . . OF CONSISTENT CUTTING EFFICIENCY

YOU CAN CUT YOUR TURNING COSTS

if your lathes have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively



for instance . . .

Here is a typical example of the effective use of Carbide Cutting Tools on a Jones & Lamson #3 Ram Type Turret Lathe. This cap screw is completely machined from SAE X-1335 bar stock in 1 minute. The turning cut, taken at 1500 RPM (Approx. 450 SFM) with .015" FEED, requires in excess of 16 HORSE-POWER. Depth of cut is .205".

Send for our folder "One A Minute" which describes this operation in detail, and contains vital information for anyone contemplating the purchase of a Turret Lathe, or wishing to better his turning operations.

YOU CANNOT COMPETE with production like this with machines less powerful, less rigid. Jones & Lamson Turret Lathes guarantee your investment. They anticipate the future in metal turning. They are built with great reserves of ruggedness. They are powered to meet even more than today's requirements for the effective use of carbide tools. Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

Jones & Lamson Lathes

ARE POWERED FOR CARBIDE

The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

DeVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

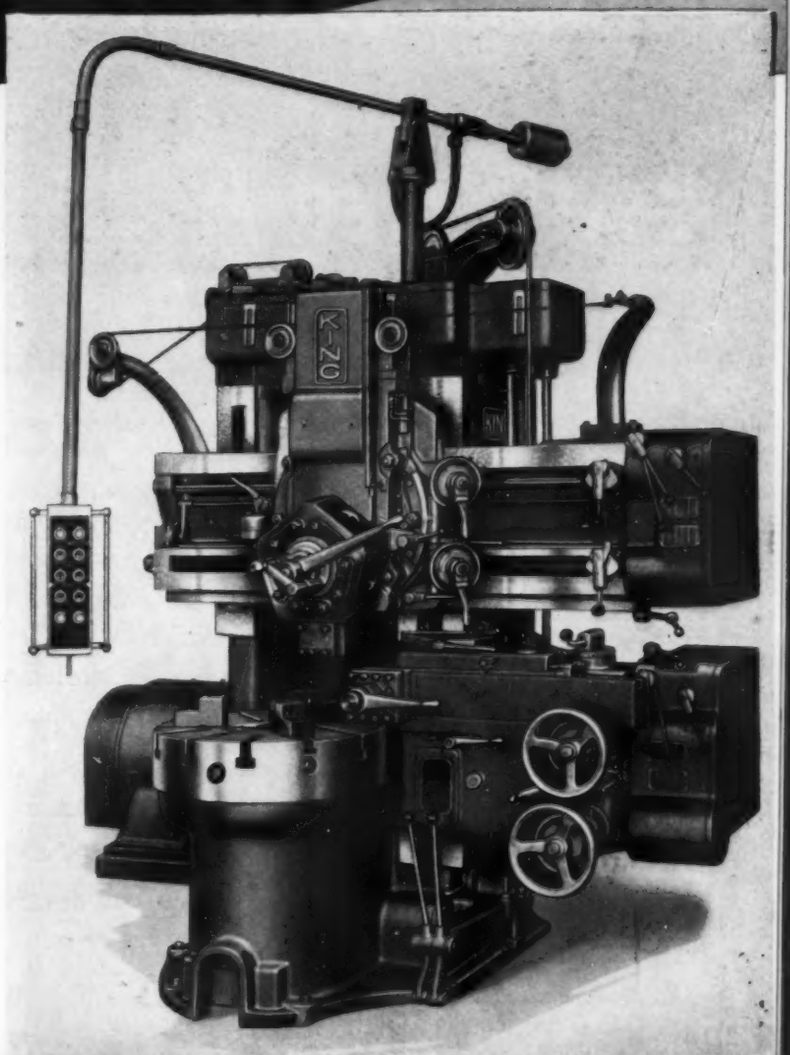
450 FAIR AVE., FERNDALE 20, (DETROIT) MICH.

JUST A COUPLE OF TWISTS OF THE HAND ADJUSTMENT LEVERS

... gives you Accurate Tool Positioning

ON THIS 30 INCH

KING NEW SERIES VERTICAL BORING & TURNING MACHINE



Following the general design of the larger New Series King Machines this 30 inch KING has been built heavier to provide necessary rigidity for the successful handling of high speed carbide tools.

And like its "big brothers" it has those refinements which save operators time and reduce costs. For instance, the angular hand adjustment levers with micrometer dials for vertical and horizontal movement of the head are an integral part of the head and move with it. Thus the operator may rapid traverse the head into position and then, from his normal work position, make final accurate adjustments easily and quickly.

This is only one of the many time and labor saving features of the New Series King Vertical Boring and Turning Machines. Incidentally, this 30 inch machine is only one of 10 sizes of the New Series King line now available. The entire line offers a complete range of sizes for 30" to 144" with either one or two heads on the rail head and side heads wherever necessary.

There's a size to meet your precision boring and turning requirements. Contact a KING Engineer for further details.

American Steel Foundries

KING MACHINE TOOL DIV.
CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes

An IDEAL / Combination

GARDNER / GRINDER

WORK DATA

Part *Brake Shoes*
Material *Brake Lining*
Operation *Grind Outer Diameter*
Tolerances *.010" for Uniformity*
Stock Removal *.015" to .020" Maximum*
Production *20 to 30 Pieces per Hour*
Feed *Hand Load and Unload to Pivoting Fixture*
Machine *Gardner 230-30" Grinder*

for MODERATE Production

Many manufacturers have a wide variety of flat-surfacing jobs — with only moderate volume on most operations. For plants of this kind, the No. 230–30" GARDNER GRINDER is *ideal.* It may be equipped with a special hand-operated table on one end, and a standard lever-feed table, for miscellaneous flat surface jobs, on the other.

In the photo above, it is grinding brake shoes with the lining attached, on the special table, with the other table free for any general-purpose work.

You can use this *ideal* combination grinder to flat-surface dozens of parts —

Write for descriptive bulletin!

GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

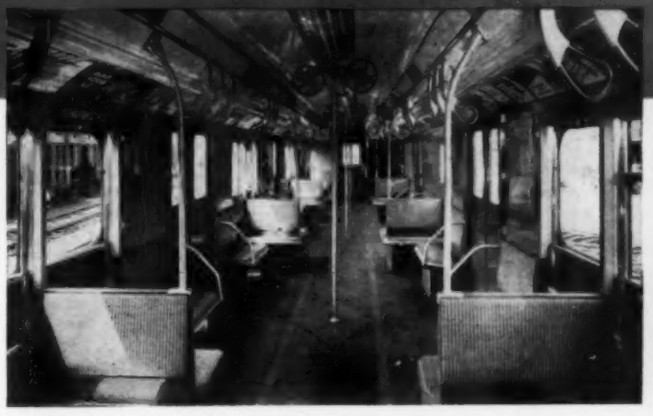
410 East Gardner Street · · · · Beloit, Wisconsin, U.S.A.

Above: This trimmer die of A-H5 tool steel has sharp edges for removing the ragged edge from center supports of 11-gauge sheet steel. Finished at the rate of 100 per hour, these members strengthen the roofs of the modern subway cars built at the Berwick plant.

Left: Easy machining is good news for the tool and die makers. This view shows a shaper taking a finishing cut on a flat of A-H5 tool steel.

Bethlehem Tool Steel at a.c.f.

A-H5 (5 pct. chrome air-hardening)



New York's subway riders will enjoy the greater comfort provided by the 750 new cars being delivered by a.c.f. for the IRT, IND and BMT systems of the New York Board of Transportation.

In building a variety of railroad and subway cars, American Car and Foundry put extra emphasis on quality in their specifications for materials and equipment. That's why we're pleased to know that production men at a.c.f.'s Berwick, Pa., plant report fine performance from Bethlehem A-H5 (5 pct chrome air-hardening) tool steel.

A-H5 is used for dies that trim, blank, notch and form many different component car parts. Materials include aluminum, carbon steel, and low-alloy high-tensile steel. Many of the dies are intricate and must hold close tolerances over a long service life.

A-H5 gives good performance because it combines these features:

- Good machinability
- Safe, uniform hardening
- High resistance to deformation
- High wear-resistance
- Sharp, durable cutting edges

Here's a grade of steel that's hard to beat when safer hardening and high wear-resistance are of special importance. It's stocked in our mill depot—and your nearest Bethlehem tool steel distributor can give you prompt delivery too.

	C	Mn	Cr	Mo	V
Typical Analysis:	1.00	0.60	5.25	1.10	0.25

Hardness: Annealed, 212 Brinell; hardened, 60 to 62 Rockwell C.

BETHLEHEM STEEL COMPANY
Bethlehem, Pa.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

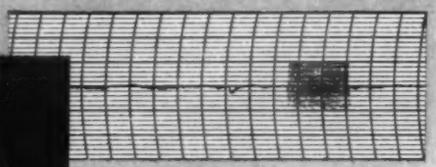
BETHLEHEM STEEL

A-H5 . . . one of Bethlehem's Fine Tool Steels

PUT IT ON THE BLANCHARD

MAKE BETTER, LONGER-LASTING PARTS WITH FINER, FLATTER SURFACES

-Eliminate Lapping!



SURFACE FINISH CHART OF BLANCHARD-GROUND PIECE, USING BRUSH SURFACE ANALYZER WITH ATTENUATOR SET AT .01. SURFACE HAS ROUGHNESS VALUE OF ONLY 2 MICRO-INCHES.

3″ Valve Plate for Hydraulic Pump. Hardened Steel.

Checking flatness of Blanchard-ground surface with optical flat. Parallel lines show surface is flat within ½ light band. (5.8 millionths of an inch.)

Cast Iron End Plate for Refrigerator Compressor.

The optical flat shows this Blanchard-ground surface flat within ½ a light band.

Checking flatness of production-lapped piece received from customer. Note the variation from flatness as shown by the curved lines.

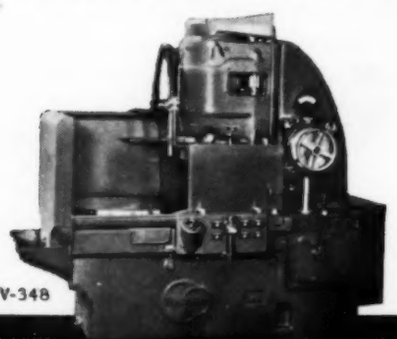
As you know, the operation of lapping charges the worked-upon surfaces with lapping grit. The presence of this lapping grit — which is practically impossible to remove — lowers the ability of the lapped surfaces to resist wear.

Blanchard research has perfected a method of flat surface grinding — using only their standard Blanchard Grinders — whereby extremely fine finishes *and* extreme flatness can now be produced in *quantity production*. The illustrations show what is being accomplished. Lapping and all other subsequent finishing operations are eliminated.

Such Blanchard-ground parts show useful life increase of up to 5 times that possible with lapped parts. Joints are tighter and withstand pressures as high as 3,000 lbs. oil per sq. in. without leaking.

If you have critical flat surfaces that require extremely fine finishes, close sizing and extreme flatness — and would like to produce them in the best and least expensive manner — it will pay you to get the advice of Blanchard engineers.

Simply send us the data, with samples if available and practical. This Blanchard Service is of course free and does not obligate you.



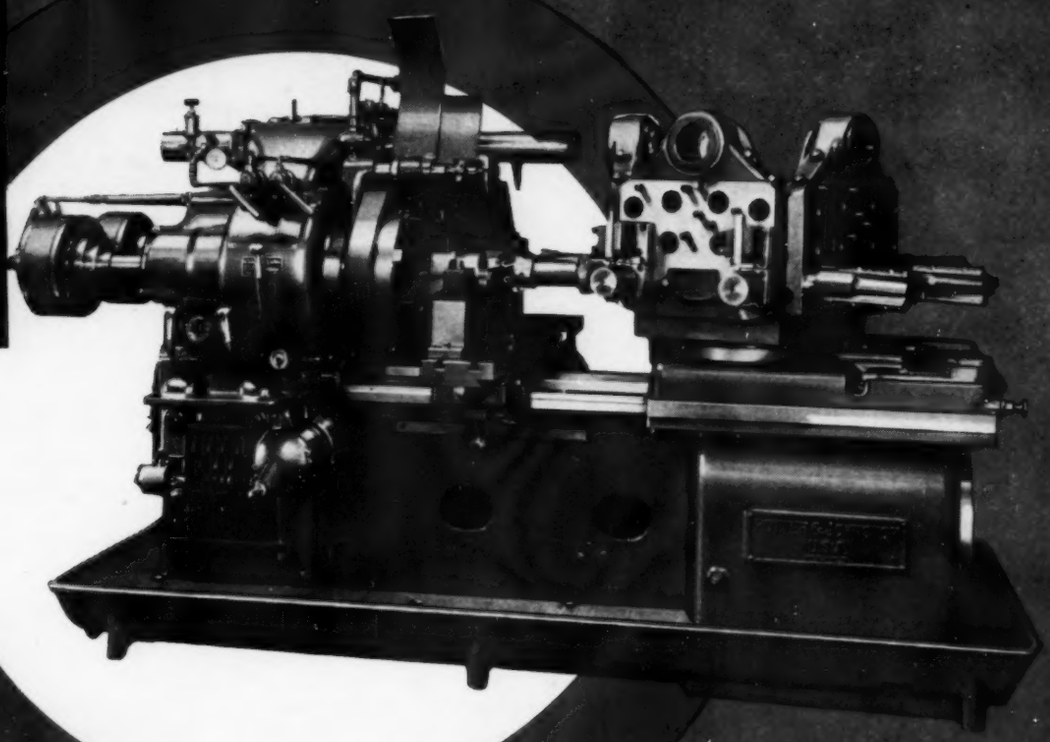
V-348

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

5D2



Output *Beyond the Capacity of a Single Spindle Machine is assured with the* P & J 5D2 POWER-FLEX

When requirements call for output in excess of that possible from a single spindle machine, the P&J 5D2 Spindle Power-Flex Automatic Turret Lathe is the logical answer.

This Model is available in 9", 12" and 15" headstock units. Power, great rigidity, four automatic changes of spindle speed while under cut, three selective automatic changes of feed and automatic binding of turret following index are provided. Maximum production is further assured by a powerful cross slide action and a constant high speed motion to cross slide and turret slide.

The cost-cutting possibilities of this machine are such as to warrant your asking P&J Methods Engineers to study your production problem and offer recommendations.

For more complete information send for catalogue 12/252.

CONDENSED SPECIFICATIONS

	5D2-9"	5D2-12"	5D2-15"
Swing over bed	21½"	23"	28"
Cross Slide Travel (each way)	5"	5"	5"
Turret Faces	5 (4&6 Special)	5 (4&6 Special)	5 (4&6 Special)
Turret Feed	11"	8"	8"
Dist. between Spindles	10½"	15½"	15½"

Other **P&J** *Automatic Turret Lathes*

Model 3U
(Swing over cross slide 9½")

Model 4D
(Swing over bed: 21")

Model 5D
(Swing over bed: 25")

Model 6DRE
(Swing over bed: 34")

Model 6DS
(Swing over bed: 34" and 40")

Model 8DT
(Swing over bed: 36")

POTTER & JOHNSTON COMPANY
PAWTUCKET, RHODE ISLAND
Subsidiary of
Pratt & Whitney

Consistent Producer

of quieter, smoother running gears

BARBER-COLMAN
NO. 16-16
HOBBING MACHINES

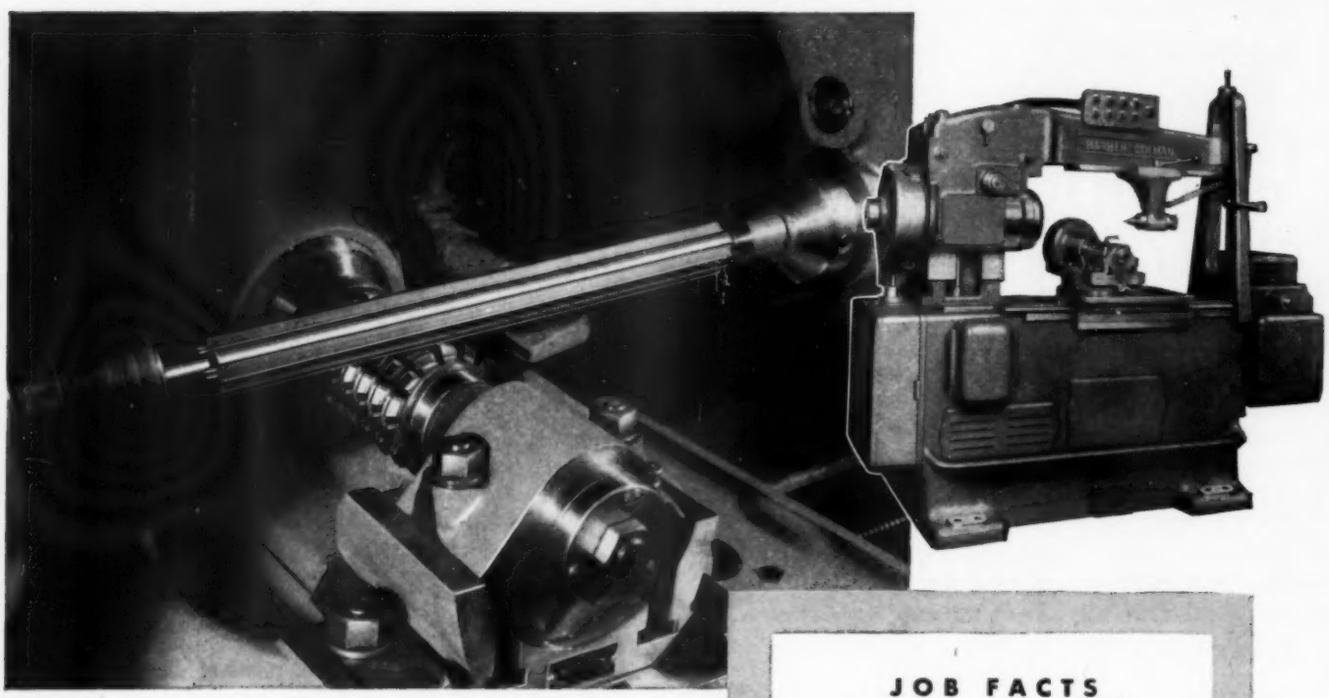
In the field of gear cutting, emphasis is on smoother, quieter running gears, made of tough materials to give dependability and life to the many products of which they become a part. The Barber-Colman No. 16-16 Hobbing Machine is built to meet these exacting production requirements.

Additional improvements and new features provide such accuracy as shown in the job record below, of .0003″ parallelism on a 14″ spline shaft. The machine has a reversing motor and control for selecting hob rotation; a backlash take-up adjustment on the feed screw; separate rapid traverse motor; and a new dial selector for setting positive stops on carriage travel. All of these new features mean faster and smoother production and improved operating efficiency.

Write for a copy of complete new bulletin describing features, tooling and operation of this Universal Hobbing Machine.

Barber-Colman Company

GENERAL OFFICES AND PLANT 108 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.



BARBER COLMAN
A COMPLETE HOBBING SERVICE

JOB FACTS

Operation — Climb Hob, 6 Key Straight Spline, 14″ long

Material — Steel, 152-187 Br.

Feed — .030″ per rev.

Speed — 103 R.P.M.

Fl.-to-Fl. Time — 28 minutes

Accuracy — Parallelism over 14″, within .0003″
Key width held within .001″

3 IMPORTANT ADDITIONS
to the Brown & Sharpe Line

THESE INGENIOUS new devices permit faster, simpler measuring of unusual-shaped parts—or in inaccessible places—with complete confidence in the accuracy of results. Their quality of craftsmanship and materials is typical of Brown & Sharpe in every respect.

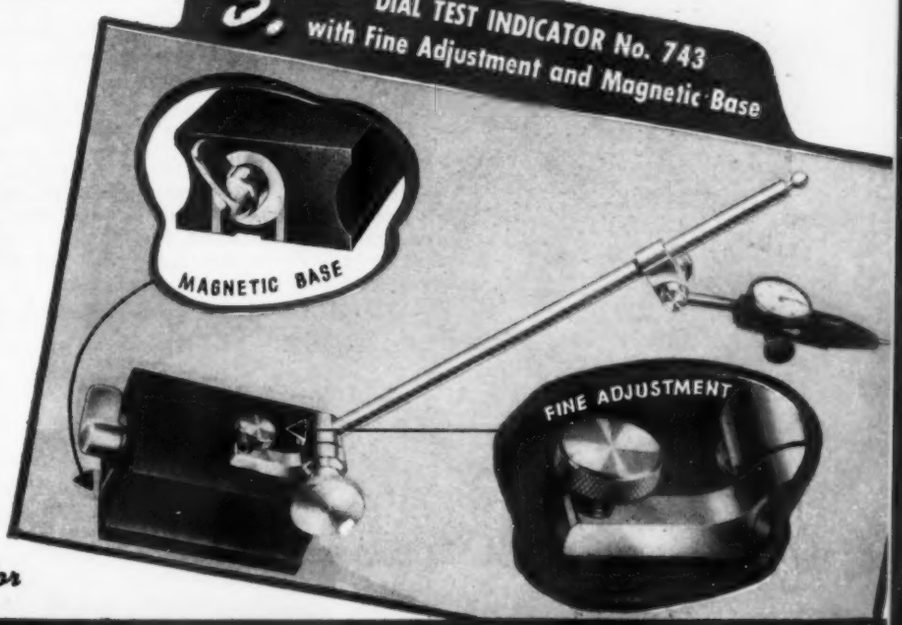
1. BALL ATTACHMENT No. 226 for Micrometer Calipers

1 This dual-utility attachment snaps on either anvil or spindle end of a micrometer caliper to facilitate measurement of curved sections. Hardened steel ball bears firmly against measuring surface. For all Brown & Sharpe micrometer calipers with conventional anvils and spindles except ½" and heavy types. Handy. Useful. Inexpensive.

2. CENTER AND SMALL HOLE ATTACHMENT SET No. 573 for Vernier Calipers

2 Center points of this attachment quickly convert a 6" or 150 mm vernier caliper into a direct reading divider that establishes center distances with precision. For locating holes to be drilled, establishing locating points in layout jobs, accurately measuring distance between two points or between a point and some locating part. Complete set includes two each; clamps, center points, small hole points.

3. DIAL TEST INDICATOR No. 743 with Fine Adjustment and Magnetic Base



3 The permanent magnet base of this device holds indicator firmly to any iron or steel surface . . . in upright, horizontal, or even upside-down position. Fine adjusting nut is used to bring indicator point to exact setting desired. Indicator's light weight reduces tendency to move. Magnet action produced by swing of lever. For sale only in the United States of America and its Territories.

Check all advantages of these new, fine tools. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE TOOLS

Van Keuren Wire Type Plug Gages

THESE EXTRA VALUES

FULL 1⅞" AND 2" LENGTH GAGING UNITS
ALWAYS ACCURATE — EXPERTLY ENGINEERED
LONG LIFE LIGHT ALUMINUM HANDLES
PROMPT DELIVERY FROM A STOCK OF 2 MILLION WIRES

TOOL ROOM SET NO. 80
Drill sizes from 1 to 80
(.228" to .0125").
Price $425.00

The New 1948 VK Catalog and Handbook No. 34 is a 208 page manual indispensable for engineers, designers, inspectors, toolmakers and machinists. It contains simplified formulas and accurate tables for measuring spur gears, helical gears, splines and worms. New and epoch making formulas and tables are presented for the first time for the exact measurement of 29, 40 and 60 single and multiple start screw threads and worms.

It includes a complete resume of American & European screw thread systems, new methods of measuring included angle of screw threads, a new method of inspecting flat ring seal surfaces with light waves, and other valuable information. Price $1.00 each postpaid.

Write for your copy

Wire type plug gages were originated by The Van Keuren Co. in 1925. They have resulted in gigantic economies for American Industry and have been widely imitated.

Only in Van Keuren Wire Type Plug Gages is the maximum value of the gage dollar fully realized. The light aluminum handles are especially designed for utility, holding power and long life. The full length gaging units have a uniform high hardness, exceptional finish, long wearing qualities and superlative accuracy.

You do not need to inspect Van Keuren Plug Gages. Our double inspection at the factory takes care of that expense for you. There is no time lost in waiting for replacements.

Van Keuren prompt deliveries will enable you to cut your gage inventory to a minimum.

On your next order specify VK Wire Type Plug Gages. VK Carboloy for long runs because of the enormous saving in cost per hole gaged . . . VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that all the parts will be within specified limits. VK Tool Steel . . . VK High Speed Steel . . . Precision Chromium Plate for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

For Super Service . . . Phone Watertown 4394

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29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

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THE RIGHT ANSWER TO EVERY TAPPING PROBLEM

More and more tap users are specifying CARD for every tapping job. They know that it pays to go to a specialist. They know that they can get the right answer to every tapping problem from this single, convenient, complete source of supply. They know that—in the test of service—Card Taps have given them long runs of threads, high output on all types of materials and under all conditions, and precision results that satisfy their most exacting demands.

S. W. CARD MFG. CO.

MANSFIELD, MASS.

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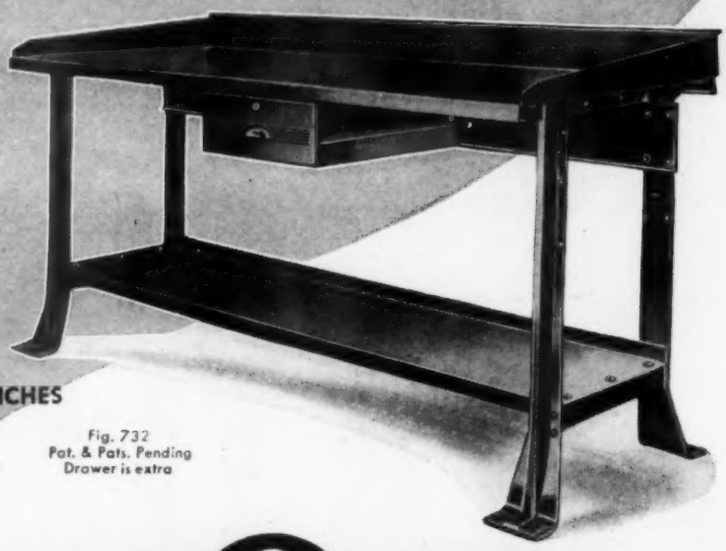
MOVABLE TOOL STANDS

Fig. 1855



WORK-BENCHES

Fig. 732
Pat. & Pats. Pending
Drawer is extra

FOREMEN'S DESKS

Fig. 2197

HALLOWELL

READY-MADE SHOP EQUIPMENT OF STEEL

...Unusual Convenience

Neat Appearance—Sturdy Construction

Fig. 2207

ENCLOSED TOOL STANDS

Save yourself the trouble and expense of designing and building your own shop equipment—make your choice from the famous ready-made "Hallowell" Line, which includes: Work-Benches, Tool Stands, Foremen's Desks, Stools, Chairs and Trucks . . . all of sturdy STEEL CONSTRUCTION.

The ready-made, smooth-top, wear-proof "Hallowell" Work-Bench as shown, is the ideal modern addition to your shop. "Hallowell" Benches are also available with laminated wood tops; or steel tops covered with "Tempered Presdwood." The "Hallowell" is made in standard heights, widths and lengths . . . does not require costly bolting to the floor, and while usually arranged as individual units, they can be easily rearranged and joined to form a continuous work-bench of most any length . . . so different from wooden benches. Attractive prices and deliveries. Ask for the "Hallowell" Catalog.

Write for the name and address of your nearest "Hallowell" and "Unbrako" Industrial Distributors.

UNBRAKO

Reg. U. S. Pat. Off.

Knurled Head and Thread Stripper Bolt

The *Knurled* Threads of this "Unbrako" Socket Head Stripper Bolt make it a "Fastener" that positively won't shake loose! This same feature solved the problem of production loss of a High Speed Die, on which *plain* stripper bolts would *not* stay.

Socket Set Screw—Knurled Cup Point

The *Knurled* Cup Point of the "Unbrako" Socket Set Screw makes it a Self-Locker—the point digs-in and "holds fast", even when subjected to the most chattering vibration.

Socket Set Screw—Knurled Threads

The *Knurled* threads of this "Unbrako" Socket Set Screw make it a Self-Locker, too, for use where other than Cup-Point must be used.

Our patented "Unbrako" Self-Locking will prevent most any set screw application from working loose. Millions prove it.

FLEXLOC

ONE-PIECE SELF-LOCKING NUTS

The one-piece, all-metal "Flexloc" packs max. utility in min. space by combining, as it does, a stop, a lock and a plain nut *all in one*. Every thread—including the locking threads—takes its share of the load . . . and the "Flexloc" can be used again and again without losing much of its locking torque. Sizes from #6 to 2" in diameter—in "regular" and "thin" types—in NC and NF thread series.

OVER 45 YEARS IN BUSINESS

Pillow Blocks

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"Hallowell" Solid Steel Collars are functionally proportioned throughout, and highly polished all over . . . 3" bore and smaller are made from Solid Bar Stock and fitted with the famous "Unbrako" Knurled Point Self-Locking Socket Set Screw. Available in a full range of sizes for immediate delivery.

*Pat'd. Pat's. Pend., or Pat's Applied for

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Speed to Fit the Job! These roller mills, equipped with *Texrope Vari-Pitch* sheaves for motion control can be set instantly to exact speed for best production under all operating conditions. Can you profit by accurate speed control? *Texrope Vari-Pitch* drives are simply and economically applied to machine tools, pumps, blowers, conveyors or other machines.

Save Money With "Pre-Engineered" Texrope Drives

You can solve 90% of all V-belt drive problems, from 1 to 150 hp, with economical stock *Texrope* V-belts and sheaves. The *one best* drive is selected quickly and simply from a new 144-page manual listing 22,000 "Pre-Engineered" drives. Bulletin 20B6956. ALLIS-CHALMERS, MILWAUKEE. *Texrope, Super-7, Texsteel, Texdrive, Magic-Grip* and *Vari-Pitch* are Allis-Chalmers trademarks.

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Super-7 V-belts	5 types . . . sizes to suit every power transmission job	
Texsteel, Texdrive, Magic-Grip	Sheaves in a full range of sizes and grooves	
Vari-Pitch Sheaves	Exact variations in speed — Stationary or Motion control	
Speed Changers	Speed variations up to 375% at the turn of a crank	

A 2428

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices.

ALLIS-CHALMERS

Originators of the Multiple V-belt Drive for Industry

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Dependability is built into Winter Taps by a carefully coordinated research program. This includes research into raw materials, heat treatment methods, and performance records in the laboratory and in the field. This interlocking research program keeps Winter Brothers abreast of the latest developments in the art of metal cutting. It assures you better performance and longer tool life when you specify Winter Taps.

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YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter Taps on his shelves — as close to your tapping problems as the telephone on your desk.

Winter Chip Driver Taps are designed for fast operation in tough alloys. They are part of Winter's complete line of carbon and high speed steel taps and dies.

Winter Brothers COMPANY

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PERFORMANCE IS BUILT INTO NATIONAL METAL CUTTING TOOLS

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Long and productive tool life depends as much on the way tools are used as on their quality and design. To help users get the most out of their metal cutting tools, National maintains a complete field engineering service. National engineers have the wide experience of the entire National organization to call on. You are invited to call on your National field engineer the next time you run into a troublesome metal cutting problem.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

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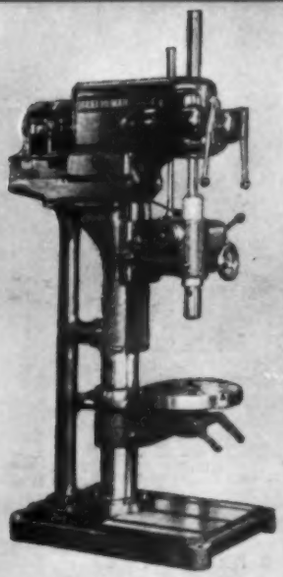
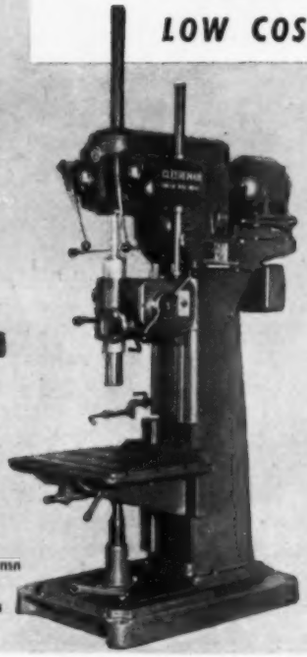
FOR SPEED — ACCURACY —ADAPTABILITY— LOW COST PRODUCTION

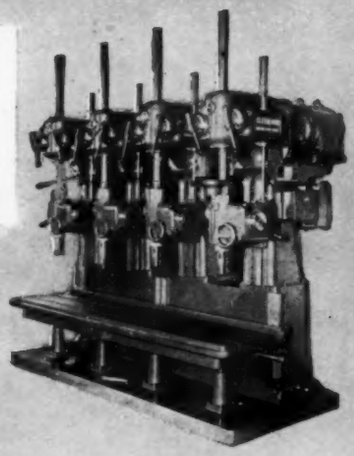


Cleereman Round Column Sliding Head Drilling Machines



Cleereman Box Column Sliding Head Drilling Machines

Cleereman No. 325 Single Unit Sliding Head Drilling Machine



Cleereman Multiple Drilling Machines

1908 - 1948 40th Anniversary CLEEREMAN MACHINE TOOL CO.

Cleereman builds a complete line of drilling machines for production work. All have won wide acceptance both here and abroad. All are noted for their high standards of performance, wide adaptability and extreme ease of operation.

The new No. 325 Single Unit Sliding Head Drilling Machine provides extreme sensitivity with rugged construction and is characterized by facility of control, exceptional flexibility and easy set-up.

Cleereman Round Column Sliding Head Drilling Machines are built in 25" and 30" sizes with a wide range of speeds and feeds. They are sturdy, precision built machines readily adapted to a wide variety of manufacturing operations.

Cleereman Box Column Sliding Head Drilling Machines in both 25" and 30" sizes have the stamina and accuracy necessary to meet the severest requirements of production work.

Cleereman Multiple Drilling Machines are available to meet individual production requirements for high speed production with accuracy and convenience.

Wire or write for Catalogs and complete specifications.

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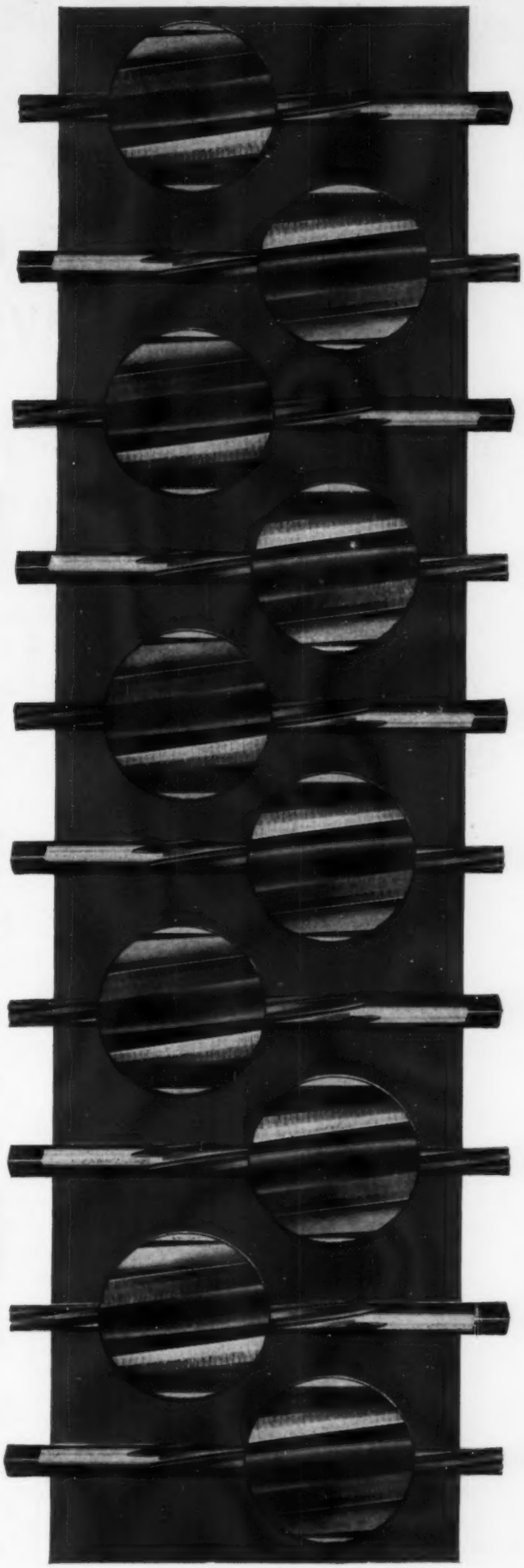
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Only 100% inspection makes UNIFORMITY certain

When you carefully examine any Butterfield Tool before you put it to work, you're not the first one to do it. Every single Butterfield Tool, from the smallest size to the largest, is individually inspected before it's considered good enough for you. Butterfield takes such pains so that you can be sure of getting uniformly good tools. Yet, you pay nothing extra for this extra assurance of getting top performance on every job.

For quick deliveries of Butterfield . . . the 100% Inspected Tools . . . depend on your nearby Butterfield Distributor. BUTTERFIELD DIVISION, Union Twist Drill Co., Derby Line, Vermont and Rock Island, Quebec.

Bar stock at Butterfield being tested for microstructure . . . one step in Butterfield's 100% Inspection.



BUTTERFIELD

THE 100% INSPECTED TOOLS

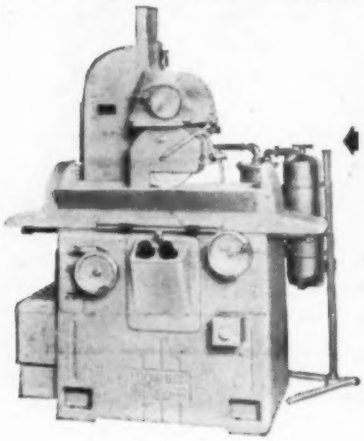
Every Tool Individually Inspected

TAPS • DIES • SCREW PLATES • REAMERS

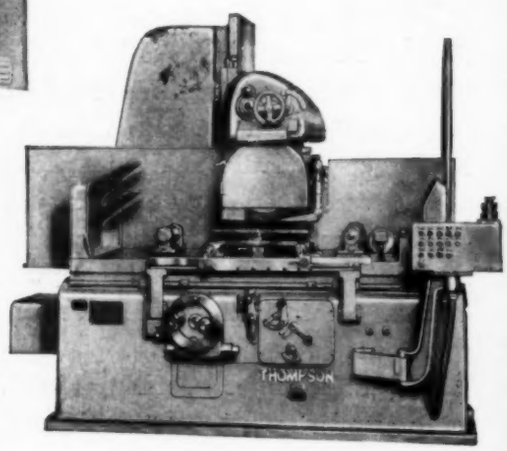
INVESTIGATE

the complete line of Thompson Machines FOR SAVINGS in grinding every flat surface or contour

At left—Thompson Heavy Duty Type CX 36" x 48" x 120" Hydraulic Surface Grinder. Equipped with super precision spindle powered with 40 H.P. motor.

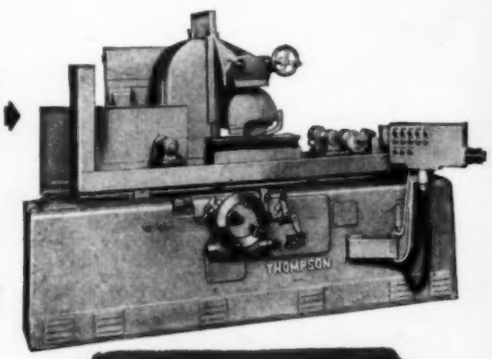


At left—Thompson Type "F" 6" x 10" x 18" Hydraulic Surface Grinder. This machine is arranged to utilize a new principle of applying coolant to the grinding wheel. All of the coolant is applied through the grinding wheel making it possible to grind exceedingly thin sections without burning or warping the work.

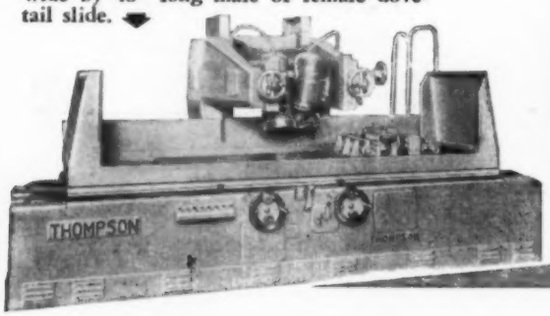


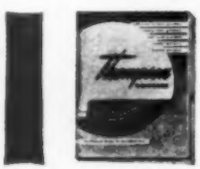
At right—Thompson Type "C" 16" x 16" x 36" Truforming Grinder. The latest design of a Truforming (Crushed Wheel Grinding) machine arranged with Thread Roll Die Grinding Fixture equipped with 20" dia. x 6" face wheel driven by 30 H.P. motor.

At right—Thompson Type "B" 12" x 11" x 36" Truforming Grinder. A new design of a popular Truforming (Crushed Wheel Grinding) machine arranged for production grinding of intricate contours.



Below—Thompson 12" x 11" x 48" Dovetail Way Grinder, designed to eliminate the expensive job of hand scraping machine tool dovetail way bearings. The machine illustrated has capacity for a 12" wide by 48" long male or female dovetail slide.





WRITE FOR NEW 32-PAGE GENERAL CATALOG

Thompson SURFACE Grinders

The Thompson Grinder Co., Springfield, Ohio

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MAKE THEM

SPECIAL TOOLS SLASH THE COST OF *YOUR* PRODUCTS

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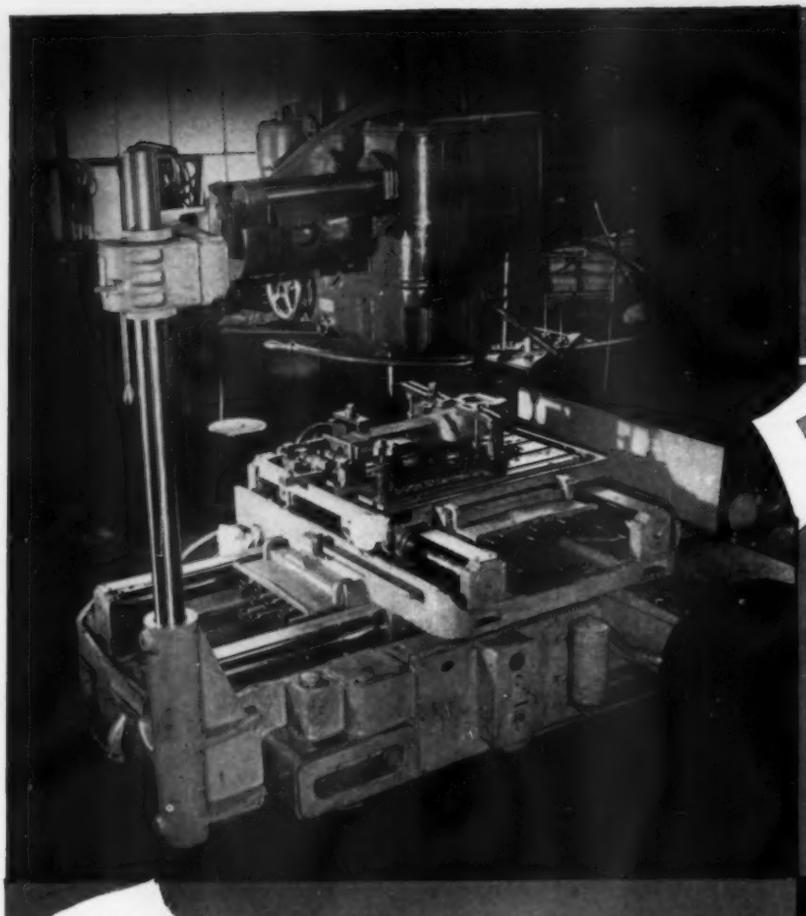
Let's talk about special tools and machines for speeding up your production. For better acquaintance ask for Vulcan Equipment List.

VULCAN TOOL CO.

DAYTON 10, OHIO, U.S.A.

Complete Tooling Programs



PRODUCTION NEWS ABOUT BULLARD MAN-AU-TROL SPACERS

1.

HERE'S HOW ONE LOOKS IN ACTION AND WHAT THE USER SAYS

This is a BULLARD 30"x20" Man-Au-Trol Spacer being used by Kearney & Trecker, Milwaukee, Wisconsin with the following reported results: "We find that on parts where we do not have fixtures, the saving is considerable. We find that due to accurate positioning, we get more accurate work. We also find new uses every day; uses which we never thought of when we purchased the equipment".

HERE'S WHAT TWO OTHERS HAVE DONE

2.

AT HEPPENSTALL COMPANY, PITTSBURGH... PRODUCTION TIME CUT BETTER THAN 36%

Drilling and countersinking 13/16" diameter holes in this chipper knife used to take 95 minutes per piece for layout and drilling. The same job done with a BULLARD 30"x20" Man-Au-Trol Spacer, including setup time, takes only 60 minutes. According to C. W. Heppenstall, Jr., vice-president of this progressive firm, this new hole-locating method is "a real advancement in the science of metal working".

HOW MUCH CAN YOU SAVE?

Your first step toward learning how much you, too, can save in production time, jig fabrication and worker fatigue is to write for the latest Man-Au-Trol Spacer Bulletin. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

3.

AT R. HOE & CO., INC., NEW YORK CITY... OVER $2500 IN JIG FABRICATION SAVED IN 3 MONTHS

This maker of fine printing presses *not only* saved time on every job handled by a BULLARD Man-Au-Trol Spacer *but also* eliminated 75 hole-locating jigs in three months for a total saving of $2500 to $3000. Officials of R. Hoe & Co., Inc. further report that plans for constructing one of the world's largest presses for the Philadelphia Inquirer will require practically no jigs because of the use of the BULLARD 30"x20" Man-Au-Trol Spacer.

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

To prevent explosions caused by sparks, Emil Greiner Co., 161 6th Ave., N. Y., offers an industrial mixer driven by air pressure.

get ready with CONE for tomorrow

Ford Motor Co. makes dies of a bismuth-tin-lead alloy which is very soft and easily formed. When chilled to −320° F. in liquid nitrogen, the metal is hard enough for use in six to ten stampings.

be ready with CONE for today

A machine that records magnetically and automatically in code is made by Codit Co. of 3535 Dell Trail, Chattanooga. The record can be played back intelligibly only on another machine set for the same code.

get ready with CONE for tomorrow

Metal "super crystals" are being made in the laboratory of the University of Virginia. They are as large as an inch in diameter, but have the same characteristics as the usual microscopic crystals.

be ready with CONE for today

A new thermometer made by Leeds & Northrup of Philadelphia measures temperatures down to 10 K with an accuracy of one hundredth of a degree.

get ready with CONE for tomorrow

Hycar P. A. is a new synthetic rubber made by B. F. Goodrich which has been tested at temperatures up to 400° F. without apparent loss in properties.

be ready with CONE for today

Plastic clamps to support wires or tubes are made by Holub Industries, Inc. They guard against cutting insulation and are nonconducting.

Associated Battery Assemblers have an automobile battery that can be taken apart, repaired and reassembled in 15 minutes.

get ready with CONE for tomorrow

Plastic gas pipe made of Tennessee Eastman's Tenite is replacing iron pipe in many installations.

be ready with CONE for today

California Institute of Technology is testing a "sweat cooling" system for jet engines. Coolant is forced through porous metal walls and cools by evaporation.

get ready with CONE for tomorrow

S. S. White Dental Co. is making dentists' burrs of cemented carbide.

Stanolind Oil & Gas Co. will soon start production of motor fuel and other products from natural gas at Garden City, Kansas.

be ready with CONE for today

The purest helium ever distributed commercially (98.8% pure) will be made available by the U. S. Bureau of Mines. It will be known as "welding grade."

get ready with CONE for tomorrow

Paper pulp from southern New England and New York hardwoods is possible with a process developed at Polytechnic Institute of Technology.

be ready with CONE for today

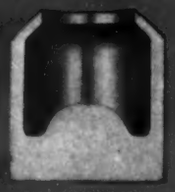
U. S. Rubber is making an insulation material of foamed ureaformaldehyde that weighs only eight-tenths of a pound per cubic foot.

get ready with CONE for tomorrow

Magnesium alloys with twice the strength of those currently in use have been announced by the U. S. Army Corps of Engineers.

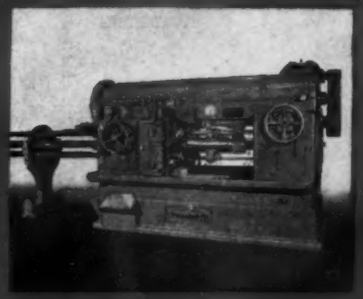
FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

ADAPTABILITY
and
DEPENDABLE PERFORMANCE
•
Conomatics give BOTH



Cross section showing interior

The sample shown illustrates a combination of ingenuity of method plus the facility of a good automatic to effect an 18-cent production saving per piece.



Ask your CONE *representative to show you our new color motion picture*

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

51

A *New* STEP FORWARD IN HOBBING

BARBER COLMAN

"MULTITHREAD" HOBS

● A multiple thread tool, producing pre-finishing tolerances, has now been perfected by Barber-Colman Engineers.

Where machine conditions are right, and the tolerances are adaptable, Barber-Colman "*Multithread*" Hobs show substantial increases in production, using existing machines. The flywheel ring gears shown below, for example, are cut, ten per load, in 24 minutes, or 2½ minutes per gear. Hob life is excellent — 11,000 gears per hob. Instead of the usual single lead, these new tools have several threads. Consequently, the work indexes faster, at a speed which is in direct ratio to the number of threads in the hob. Production time is reduced accordingly. As a result of production gains possible with Barber-Colman "*Multithread*" Hobs, a fewer number of hobbing machines are required to complement finish shaving or grinding equipment. These hobs are recommended only on the basis of a comprehensive analysis of the job factors in individual plants. Therefore, we suggest that you ask a Barber-Colman Representative to call.

Barber-Colman Company

GENERAL OFFICES AND PLANT 108 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

JOB FACTS

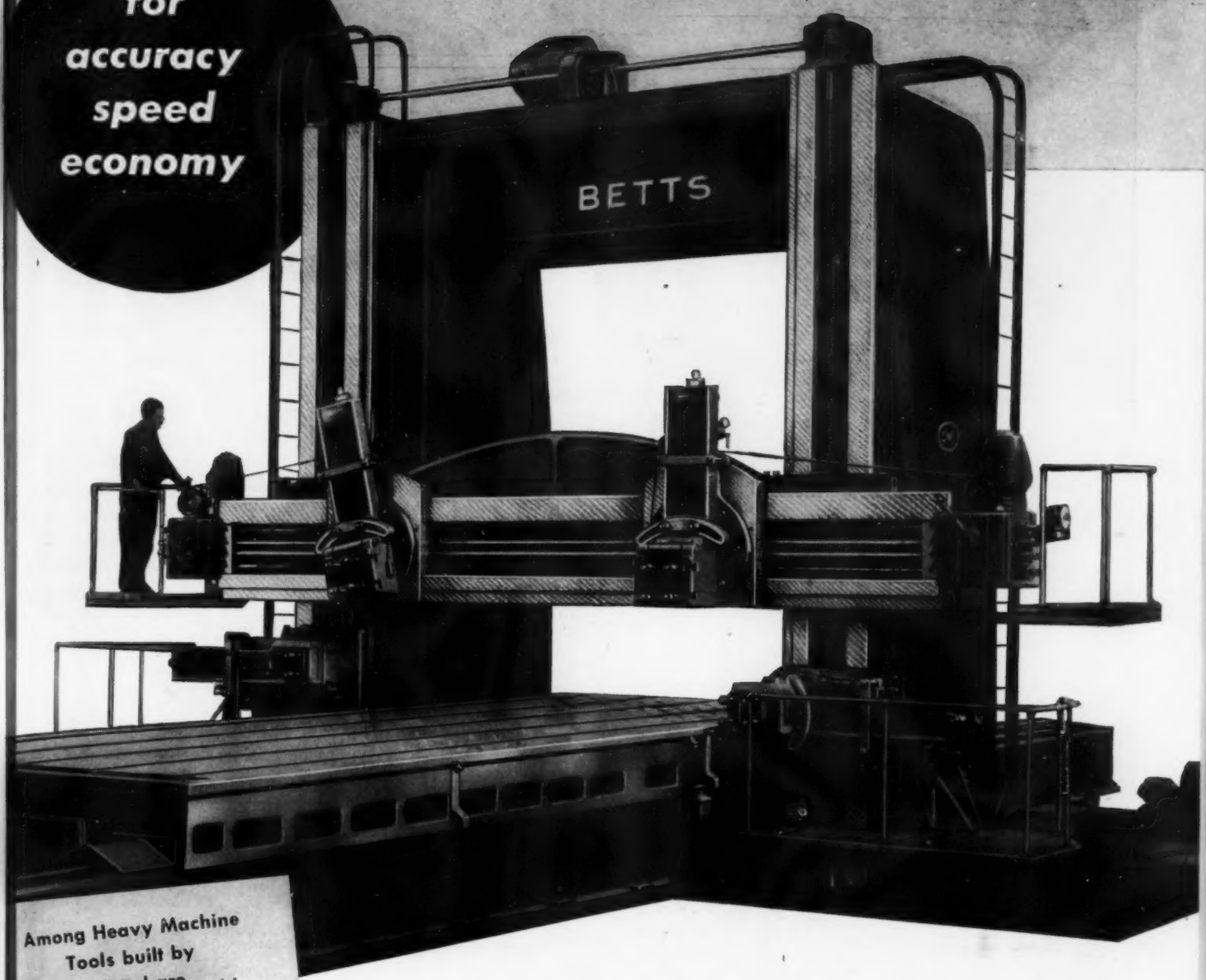
Operation—Climb Hob Ring Gears
Hob—Barber-Colman Unground "*Multithread*" hobs
Machine—Barber-Colman No. 14-15
Material—SAE 1050, R.C. 46-52
Feed—.30″/min. Speed—98 RPM
Cutting Time—25 min., load of 10 blanks
Tool life—11,000 gears per hob, former life 4200 gears per hob
Tolerance—±.0025″ over pins

MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

BARBER COLMAN

BETTS HEAVY DUTY PLANERS

for accuracy speed economy



Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

The Betts Heavy Duty Planer shown here provides 14′-0″ between uprights, 11′-6″ under tools and 28′-0″ stroke. It is designed with three bed ways for even load distribution when machining especially heavy work. Variable voltage planer drive provides smooth, accurate operation in a wide speed range. Built in a range of sizes up to any requirement. All Betts Planers are soundly engineered to insure long, dependable service combined with operational economy, safety and convenience.

Complete information will be furnished upon request

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

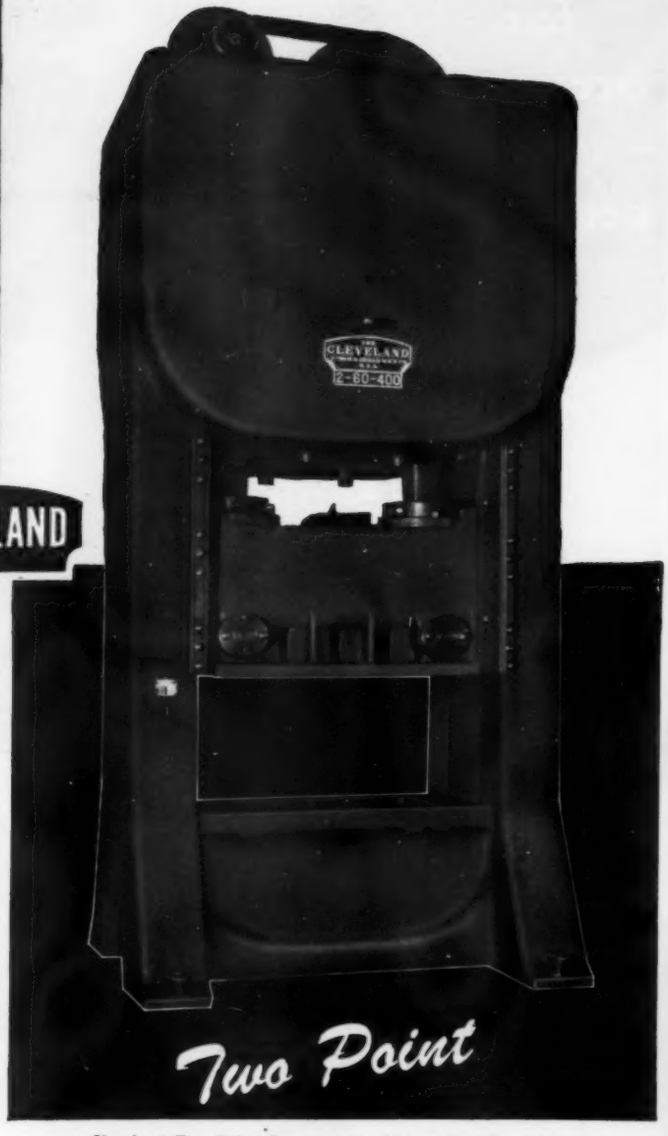
CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Single Point

Cleveland Single Point Press, stroke 14", adjustment 6", shut height 26½", bed area 48"x42", capacity 500 tons.

CLEVELAND



Two Point

Cleveland Two Point Press, stroke 20", adjustment 6", shut height 30", bed area 42"x60", capacity 400 tons.

The Presses illustrated above, which are typical of the Cleveland line of Single and Two Point Presses, and embody every modern improvement, were designed to meet the demand of Pressed Metal Manufacturers for Mechanical Power Presses having greater precision and strength than the conventional Straight Sided Single and Double Crank Presses. The rugged, compact construction of the Cleveland Presses assures long life and low up-keep, while the features incorporated in their design provide faster, better and more accurate production without interruption.

If you are interested in Single Point, Two Point (or Four Point) Presses, we offer you competent engineering service in the selection of the most suitable type and size for your particular requirements.

CLEVELAND

DRUM-TYPE CLUTCH

With this new Cleveland air operated Drum Type Friction Clutch, with spring loaded brake, you are always assured of **full** clutch or **full** brake, never half clutch and half brake. Furthermore, as there is complete disengagement of all idle friction surfaces, there is no drag or unnecessary wear on the linings, a feature which eliminates heat and assures longer friction "life." If interested we will be glad to mail you a copy of our Drum Type Clutch folder, on request.

CLEVELAND PUNCH and SHEAR WORKS COMPANY

EAST 40th and ST. CLAIR AVENUE • CLEVELAND 14, OHIO

District Offices: NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

Vital Machines Produce More . . . with the Right Oils

Your production machines are really geese that lay golden eggs. That's why you can't afford to take chances on anything that might slow up or stop their output.

The wrong oil can cause a burned out bearing or gear failure or a scored cylinder. The result—a dead "goose," lost time, big repair bills. Yet the cost of the right oil to prevent this is chicken feed, compared to the benefits.

Socony-Vacuum's Correct Lubrication program will assure you of the right lubricant for every bearing in your plant—and every gear and cylinder, too. Get this program now and keep your golden geese on the job.

Socony-Vacuum

Correct Lubrication

SOCONY-VACUUM

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SOCONY-VACUUM OIL CO., INC., and Affiliates:
MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

GRAY PLANER CUB

Gang up...

YOUR SMALL WORK ON A NEW

Gray Openside Planer Cub

Secure the advantages of...

- **MULTIPLE HEAD PRODUCTIVITY**
- **INCREASED ACCURACY**
- **GREATER RIGIDITY**
- **SPEEDS UP TO 300 FT. PER MIN.**

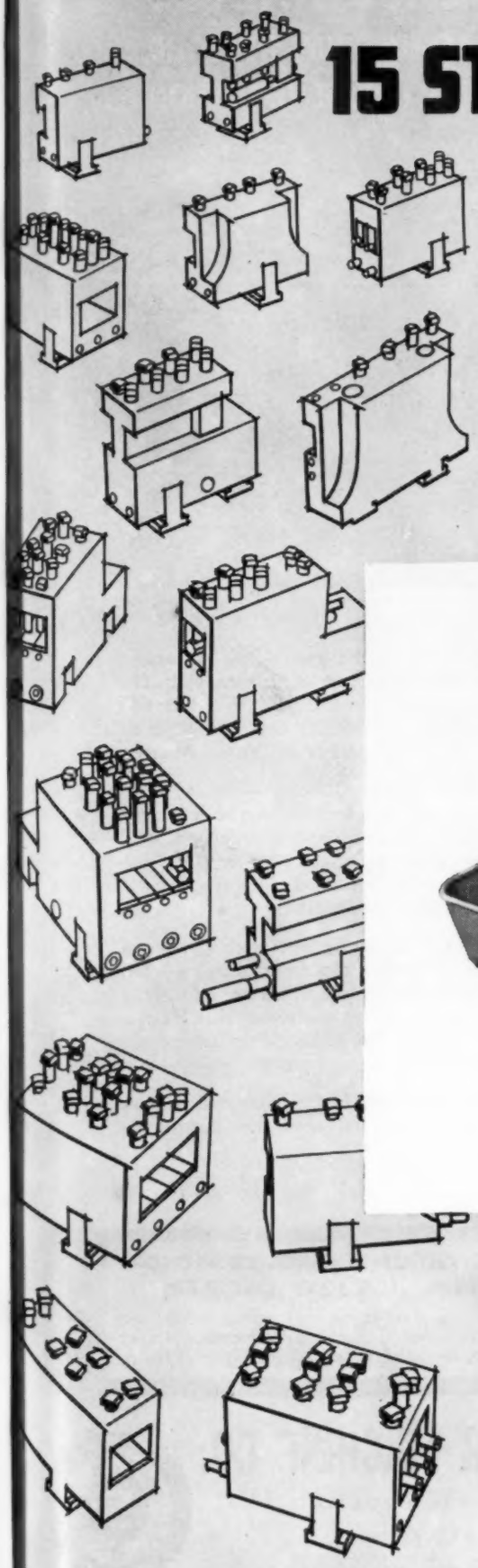
Built in 24, 30, and 36" sizes. The Gray Openside Planer Cub has the speed and rigidity demanded by modern carbide planing.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

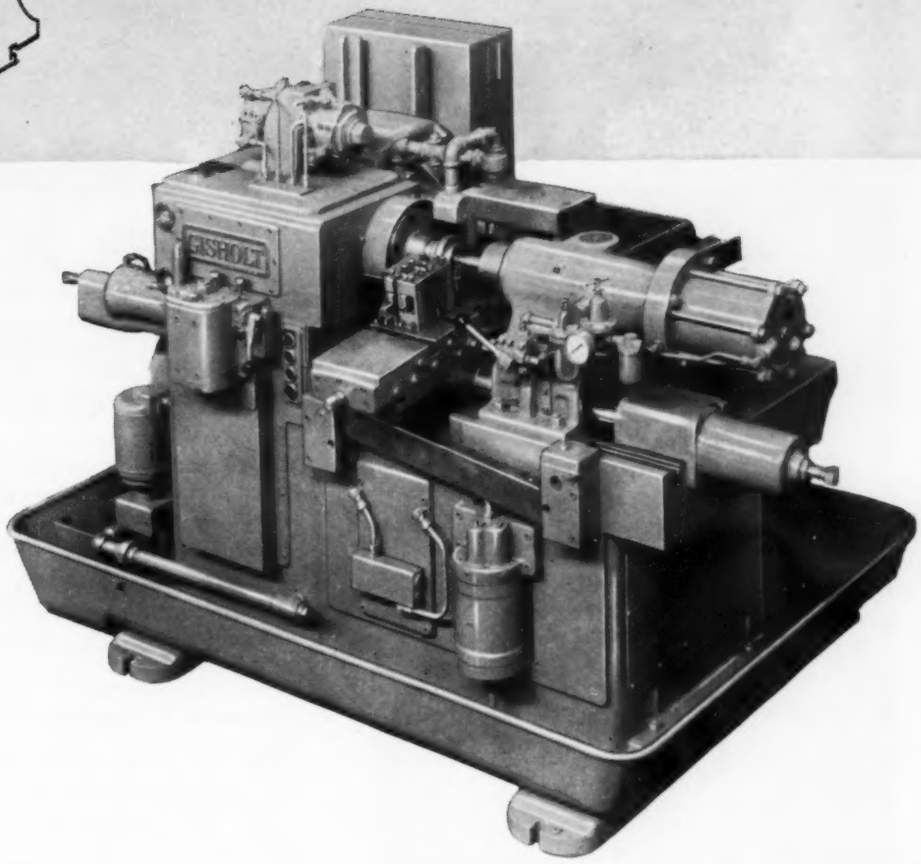
GISHOLT No.12 HYDRAULIC AUTOMATIC LATHE



15 STANDARD TOOL BLOCKS

cut down tooling costs.

They're handy for small lot work—available from stock.



GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

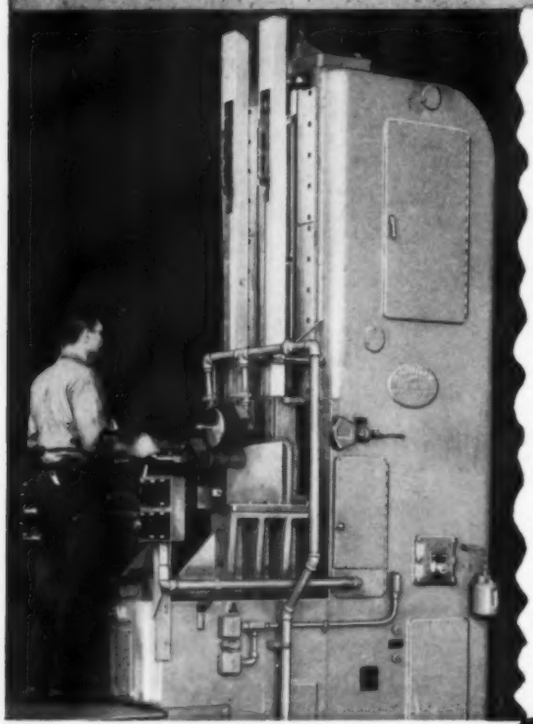
THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

DIFFERENTIAL CASE HALVES

FINISH BROACHED FROM THE SOLID IN ONE OPERATION

Three progressive views of differential case half (shown about ¼ actual size), broached on an *American* SB-66-15 surface broaching machine. *Left:* unbroached part; *center:* mating grooves broached on left-hand fixture; *right:* completed part with two additional grooves broached on right-hand fixture.



American SB-66-15 surface broaching machine tooled for broaching differential case halves. Interchangeable locators are provided for broaching either the large part shown or the mating half.

Finish broaching from the solid is an important advantage of this *American* engineered job. On this *American* single ram pull down machine, a full 66" stroke is used in broaching differential case halves. Half round mating grooves are rough and finish broached from the solid in one pass.

The malleable iron parts are first located in the left-hand fixture, with location taken from boss and counterbore, and index from flange hole. Location for second pass on right-hand fixture is also taken from boss and counterbore, and index from the previously broached slots.

Counterbalanced clamps are manually operated. Hardened and ground holders are guided in the fixture to hold tolerance and maintain accuracy. These holders are connected to the machine slide. Broach sections are removable for fast resharpening and have taper wedge adjustments behind the full round finish sections.

This unit duplicates a previous installation which has broached these automotive case halves to the customer's satisfaction for over ten years.

LEARN ABOUT SURFACE BROACHING FROM THIS NEW CIRCULAR

A new circular gives full specifications on *American* surface broaching machines. Write for your free copy today. Just ask for Circular 300A.

AMERICAN

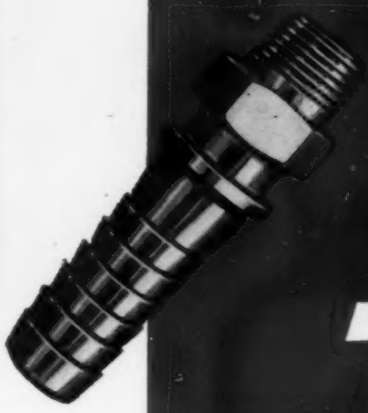
American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

You can make parts like these on automatics—



AT A CUTTING OIL COST OF ONLY 7¢ A GALLON !

What! A cutting fluid for only 7 cents a gallon?

Yes, sir: Antisep All-Purpose Base, the best coolant you can buy for any money, giving top performance from every angle—finish, tool life, operators' satisfaction, etc.

It's a cutting base combining all the necessary film strength, lubricity and anti-welding properties you can get in any oil. You mix it with WATER, and use the solution at 15-to-1 to 30-to-1 in automatic screw machines. Here are its proven advantages:

1. **Economy—water costs less than oil.**
2. **Safety—no danger to machine bearings, for water solutions have high film strength.**
3. **Cool work—pieces not too hot for operators or inspectors to handle. No blueing.**
4. **Antiseptic treatment provides freedom from rancidity; kind to every skin it touches.**

This base, high in fatty oil, will handle 90% or more of all your machining or drawing operations. Get the whole story from E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.

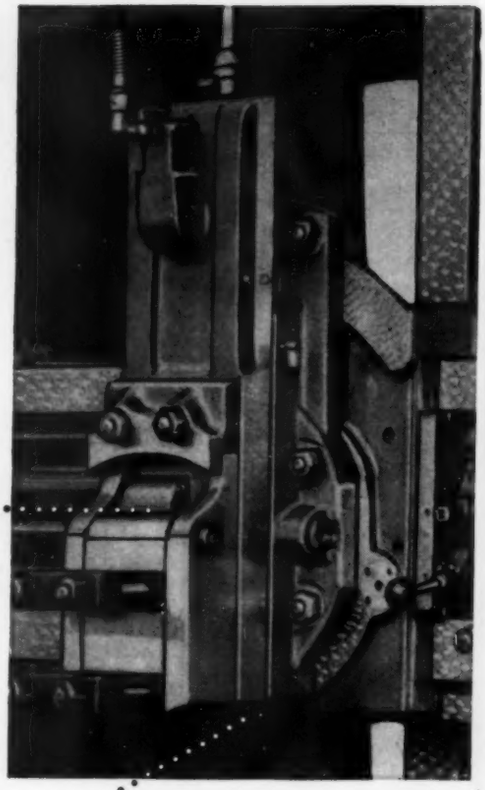
Houghton's new

ANTISEP

All-purpose Base

Both *in the Hypro rail head*

. . . these exclusive Hypro dependable features

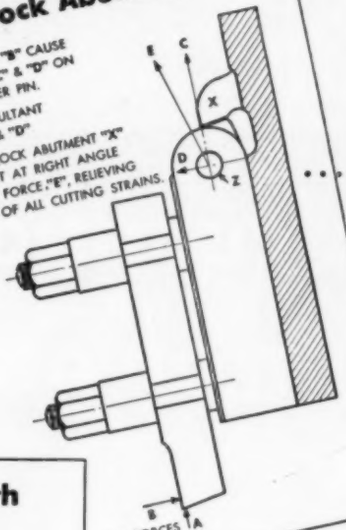


Exclusive Cincinnati Hypro Tool Block Abutment

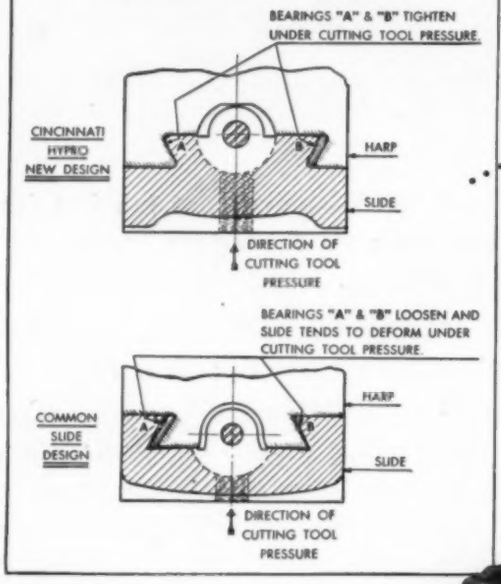
(1.) CUT FORCES "A" & "B" CAUSE ACTING FORCES "C" & "D" ON CLAPPER BOX TAPER PIN.

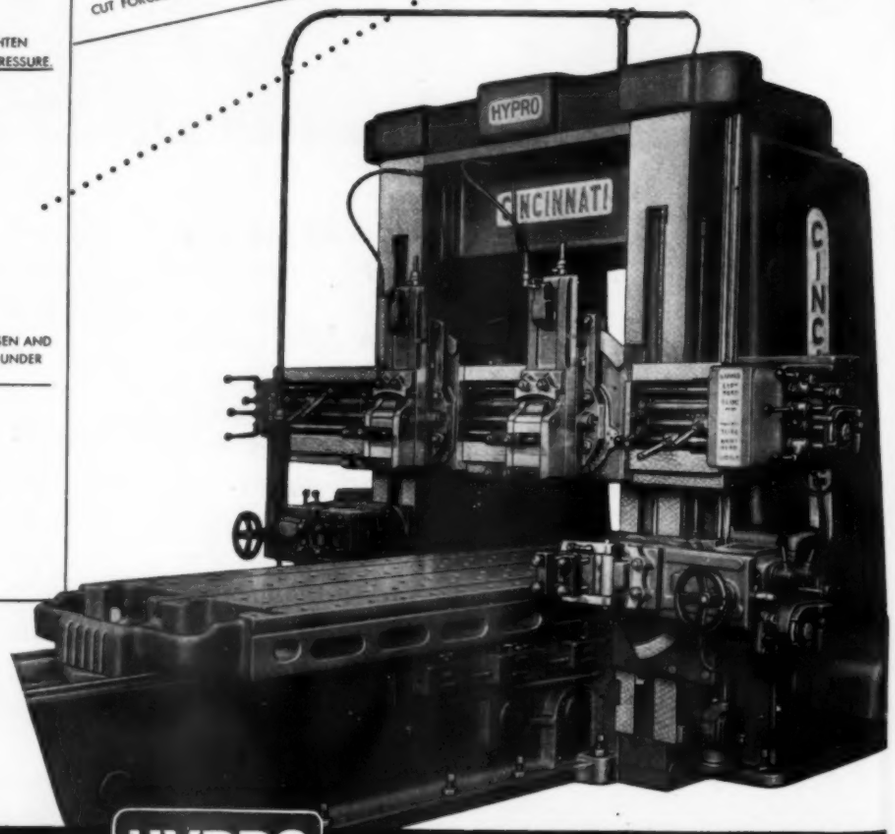
(2.) FORCE "E" IS RESULTANT OF FORCES "C" & "D"

(3.) HYPRO TOOL BLOCK ABUTMENT "X" IS PRECISION FIT AT RIGHT ANGLE TO RESULTANT FORCE "E", RELIEVING TAPER PIN "Z" OF ALL CUTTING STRAINS.



Full Bearing Slides with Inverted Dove-tail

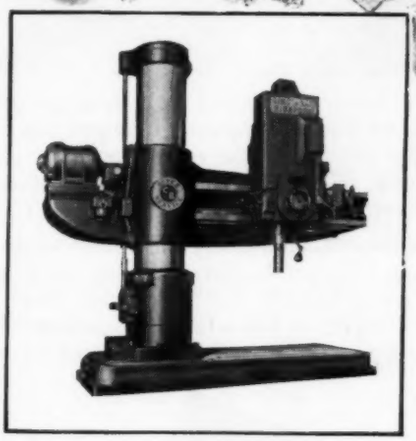




THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO



THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

On EVERY JOB you do—

The smooth, chatterless, powerful and durable drive of the Cincinnati Bickford Super Service Radial Drill is a success factor in every job you do.

Driven by 10 splines machined from the solid, the driving gear is mounted on a special continuous bronze alloy sleeve which is carried by anti-friction bearings mounted on close centers.

Herringbone, continuous tooth gears are used for the lower speed ranges—for strength and smooth-rolling action.

The large continuous tooth gear never exceeds 500′ peripheral speed a minute, automatically declutches at high speeds and eliminates strains of flywheel inertia on high speeds and on spindle reverse.

Such design and engineering give Cincinnati Bickford Super Service Radial Drills great accuracy and a long life of trouble-free operation.

Write for the detailed bulletin No. R-29 for complete data.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

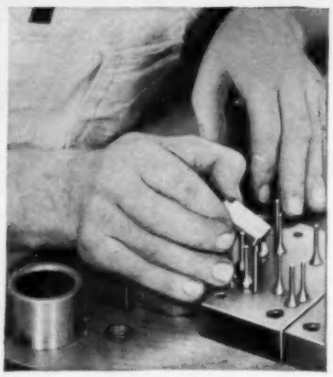
• 7200 stainless steel stampings per hour—

• tolerances held within 0.002" —

... using

DANLY

STANDARD PRECISION DIE SET



Sustained operating precision of die set reduces die wear...produces 200,000 stampings per grind

Inherent accuracy in Danly Die Sets permits taking full advantage of the die maker's precision under actual press operating conditions. As a result, close tolerances may be held and tool life is substantially increased.

In the stamping operation shown, stainless steel parts for electrical instruments are pierced, formed and blanked in an intricate progressive die. Tolerances are extremely close, and finished parts must pass rigid gage inspection.

Stampings are produced at a rate of 120 per minute. At this high speed, a tolerance of 0.002 in. is held on inside and outside diameters and the distance between the bent arms. Danly Die Set accuracy is a major factor in maintaining punch-and-die relation, resulting in production of 200,000 parts between grinds.

DANLY ENGINEERING SERVICE—Use Danly Die Sets to insure the same close precision, high production and long die life on all of your press work. Consult our Engineering Dept. for helpful recommendations on die sets—large or small, standard or special—for *any type* of press operation. (No obligation.)

DANLY NATION-WIDE ★ASSEMBLY SERVICE

Danly offices in 10 key cities give immediate attention to your orders. Assembly plants (marked with stars) stock interchangeable parts for quick delivery of any standard die set to your specifications.

- ★ **Chicago 50,** 2100 S. 52nd Ave.
- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan Ave., N. W
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- ● **Milwaukee 2,** 111 E. Wisconsin Ave.
- ● **Philadelphia 44,** 18 W. Chelten Ave.
- ★ **Rochester 4,** 16 Commercial St.

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Write for this informative bulletin, indicating the nature of your requirements.

DANLY

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS...STANDARD AND SPECIAL | MECHANICAL PRESSES AND PRESS EQUIPMENT

SPOT NEWS OF METALWORKING

Russian representatives are attempting to secure refunds of cash advance payments made to machine-tool builders for machines which Washington will not allow to be delivered. Two Russians are now going to individual builders one by one for this purpose.

France will get biggest share by far of farm machinery, especially tractors, scheduled for Western Europe by ECA. U.S. makers feel that this machinery probably won't be utilized efficiently unless it is distributed abroad through regular dealers who can help educate users.

One steel consumer in Chicago area estimates that it has paid premium of $1 million above market price in past year to get steel it needs. In that time it has not resorted to the gray market but has participated in conversion deals.

Wings and fuselages of some planes being designed will be made from aluminum sheets two to five inches thick. Weight will be relieved by milling, form rolling or by pressure forming sections for spar mounting and gas tanks in huge presses.

Machine tools valued at $2 million have been purchased by an Argentine firm (Wecheco Co., Buenos Aires) at the Milan International Samples Fair, reliable sources report.

Army Air Forces let a $2½-million contract for overhaul of 45 Douglas C-54 transports to Texas Eng. & Mfg. Co. after studying five bids. This concern's backlog of orders is now above $6 million, nearly the total amount of work done during 1947.

Metalworking industry continues to hold its own despite shortages of materials and strikes, with American Machinist Index of Production unchanged during April at 226.

Cartel control of scarce industrial materials is being urged on President Truman as the most feasible way of dealing with defense and foreign-aid pressure. This isn't the label, but an amendment to the voluntary control law now up will produce almost the same condition.

Management's stiffening attitude toward third-round wage increases has caused unions to stall off showdowns as much as possible as strikes thus far have produced little good for labor.

Checkoff of union fees and assessments must be voluntarily authorized by the employee, irrespective of any contract provision to the contrary, beginning July 1.

British efforts to book Russian orders for capital equipment have run into these snags: (1) difficulty of getting performance specifications of the exact types of equipment wanted; (2) disagreement on prices; (3) insistence of British manufacturers on the Russians making progress payments; and (4) Russian attempts to reserve right to decide whether goods are acceptable at time of delivery in a Soviet port.

Body styles will be big feature of 1949 cars. But emphasis will be on economy and automatic drive the following year. Certain car makers are experimenting with higher compressions and fuel injection. Latter will eliminate carburetor but whether metering device can be built for reasonable price is still manufacturing problem.

Japan hopes to export $50-$75 million of machinery and other metal products this year. First large export contract is for $6 million of textile machinery to India. Ships and general industrial equipment, but not machine tools, are among the export items.

Air Force is reported plumping for its own Ordnance Department which would handle procurement of all armament for Air Force planes. This armament now is supplied by Ordnance Department of the Army.

Gaging Metalworking

Metalworking production is suffering from a steel shortage made more acute by the recent coal strike. The sharp decline in motor car output, caused by the Chrysler strike and Ford's retooling program, pulled down the record in May.

▸ Though backlogs are shrinking in many metalworking lines, including some consumer items, peak operations will be sustained the next few months. In general, the tonnage of steel available will determine the volume of production.

▸ Manufacturers are rapidly awakening to the fact that defense orders, mostly related to aircraft, will be slow in trickling down to contractors. Moreover, they will be specialized and will give a "lift" to only certain segments of metalworking. The program as a whole, after all, is not startlingly large.

ECA Orders Deferred

Orders for capital goods for western European countries, too, are not close at hand. The big stuff appears to be months away. That is particularly true of machine tools and other kinds of machinery. Much of the heavy goods required by ECA will not reach the order stage until late in the year.

Third-round wage negotiations are at an explosive point in several metalworking centers. Management is spending more time talking with union committees than in doing anything else. It doesn't know whether the men will go out or not. At many spots the situation has deteriorated into a war of nerves. A "watchful waiting" policy is being pursued until the outcome of the Chrysler strike is known.

Productivity Improves

One encouraging factor: productivity per manhour is improving. It isn't yet up to the prewar mark in many plants, but is considerably better than a year ago. It probably would be even better if shops had enough materials to keep a continuous flow of parts to machines and to assembly lines. Typical of conditions is the experience of one company which is confident that it could increase productivity 20% if it did not have to start and stop its production lines so frequently because of lack of materials.

▸ Steel users are resorting to all sorts of practices to get steel without going into the gray market. So-called conversion deals are not uncommon. One company, for instance, says that it can get substantial tonnages in that manner at a total cost of about $115 a ton, compared with a mill price of $65. Gray market sheet steel brings as high as $350.

July Steel Allocations Cut

Stainless steel consumers are holding their tonnages as bait to get mills to give them a reasonable allotment of carbon steel sheets and plates. Alloy steels, incidentally, are not as tight as carbon steels. Certain carbon steel mills, blaming loss of output on the coal strike, have cut July allocations completely out of their customer's third-quarter tonnages.

▸ Pig iron too is a source of worry. Stocks of some users have been pared to a matter of six or seven days' supplies. Demand is so terrific that buyers are willing to pay $65 to $70 a ton to keep production rolling.

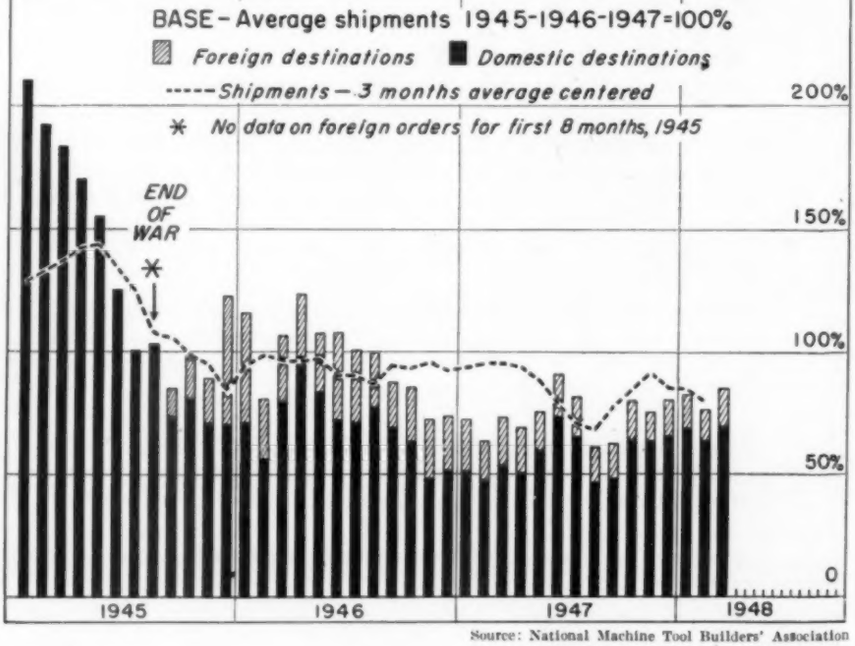
▸ Copper is not an immediate problem with most consumers, but users are watching the situation closely. They fear that within 60 days the market will get tighter. Some sellers are unwilling to make firm commitments beyond June 30 and wish to take orders instead on a month-to-month basis.

Machine Tool Buyers Hold Off

Machine tool builders are facing the biggest order period since the war, what with the tooling necessary for aircraft production plus prospective European business. However, little improvement is expected immediately. It is apparent that the conversion of inquiries into orders will take time and the volume of fresh orders during June may not be big.

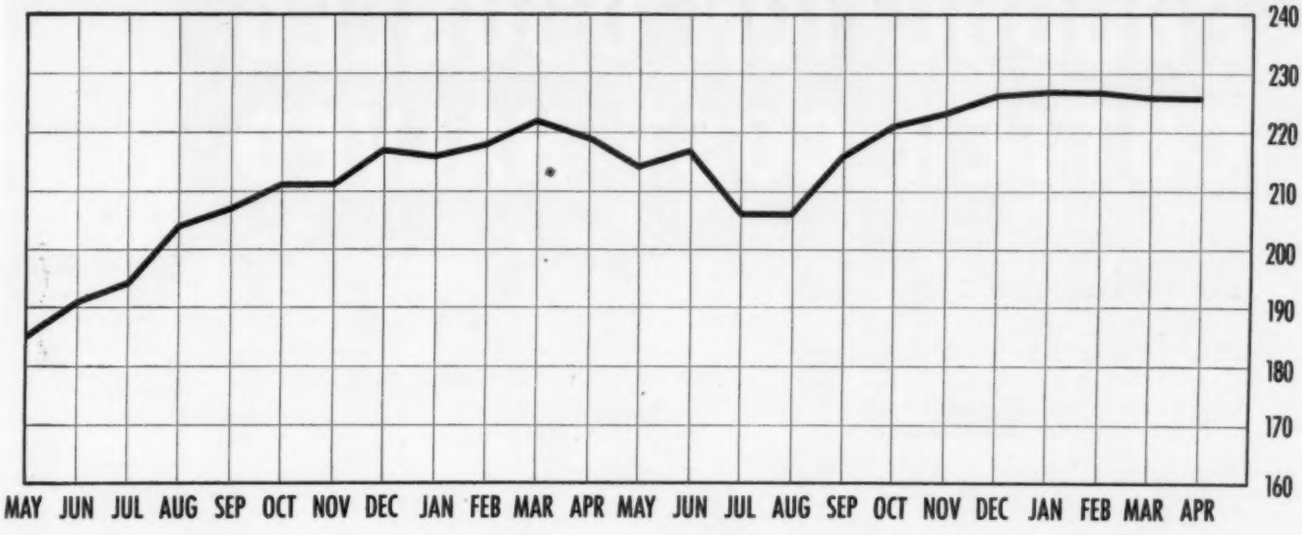
▸ There is an understandable tendency on the part of many domestic buyers to hold off new programs on their regular products until they learn exactly what they will be asked to do, if anything, in the defense effort. This tendency is reflected in reduced sales of machine tools. Meanwhile individual machine tool builders are working closely with the Air Force in trying to solve knotty machining problems in con-

MACHINE TOOL PRODUCTION INDEX GAINS



Source: National Machine Tool Builders' Association

American Machinist INDEX OF METALWORKING PRODUCTION



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nection with projected jet-engine manufacture.

▸Foreign business, contrary to some reports, has not faded out of the machine tool industry. Even with dollar trouble, export is contributing around 15% to total new bookings. South America, especially Argentina, is providing a portion of it.

Tool and Die Backlog Rises

Orders taken recently by contract tool and die shops were the best since October. They still are disappointing, however, and are not well spread throughout the industry. Some New England firms, to be specific, have been doing only 70% as well as in the same period a year ago. Production has been down a little from the 1947 level in all the principal centers.

▸Shops in the Cleveland, Chicago and Milwaukee areas are extremely busy. The industry's backlog has risen a bit, mostly because of the big chunk of new orders booked in these areas. Distributed evenly among all shops in the country, this pile up of business would provide about six weeks of work.

▸The majority of recent orders have been for tooling for special machines, with a sprinkling of business coming from defense contractors. A portion of current bookings originated with firms doing experimental and development work on rearmament. Skilled craftsmen continue to be hard to find.

Construction Machinery Brisk

Construction machinery makers are not worried about the immediate future. They have about all the business they comfortably can handle. Manufacturers of items such as shovels have a year's back-up of orders.

▸Tractor and farm implement builders are operating at capacity, with no letdown anticipated. Number of units to be exported to western Europe is not likely to be much more than it has been. Marshall Plan money merely will keep the volume at the present level; without this new source of dollars, foreign shipments would slide off sharply.

Appliance Output at Peak

The tight situation in electric turbines and generators is unrelieved. Manufacturers are booked solidly into 1951. Deliveries of motors, by contrast, have shortened. Fractional horsepower motors, for example, can be secured on short notice. Integral motors lengthen in deliveries as the size increases, the largest sizes being quoted up to two years.

▸Output of household appliances of all kinds will stay at very high levels during the summer. Makers of refrigerators, washing machines, electric ranges, electric water heaters and dish-washing units will be pushing plant capacities hard. Television transmission and receiving sets are in great demand; sales will be limited only by the industry's ability to produce units.

Aluminum To Feel Pinch

The aluminum situation will become more critical as the weeks go by. Midsummer, in fact, will see the real pinch begin. That is the time when producer's pipelines and reserves will be pretty much depleted. There isn't enough power to increase substantially the output of aluminm pig and ingots.

No one knows for sure how much aluminum will be needed for the projected plane program. In anticipation of a squeeze from that direction, some of the larger aluminum users are studying carefully their requirements over the remainder of the year and soon are expected to be ready to place orders for the fourth quarter.

PRODUCTION DOUBLED
CUTTER COST HALVED

Actual results achieved through the use of Texaco Sultex Cutting Oil.

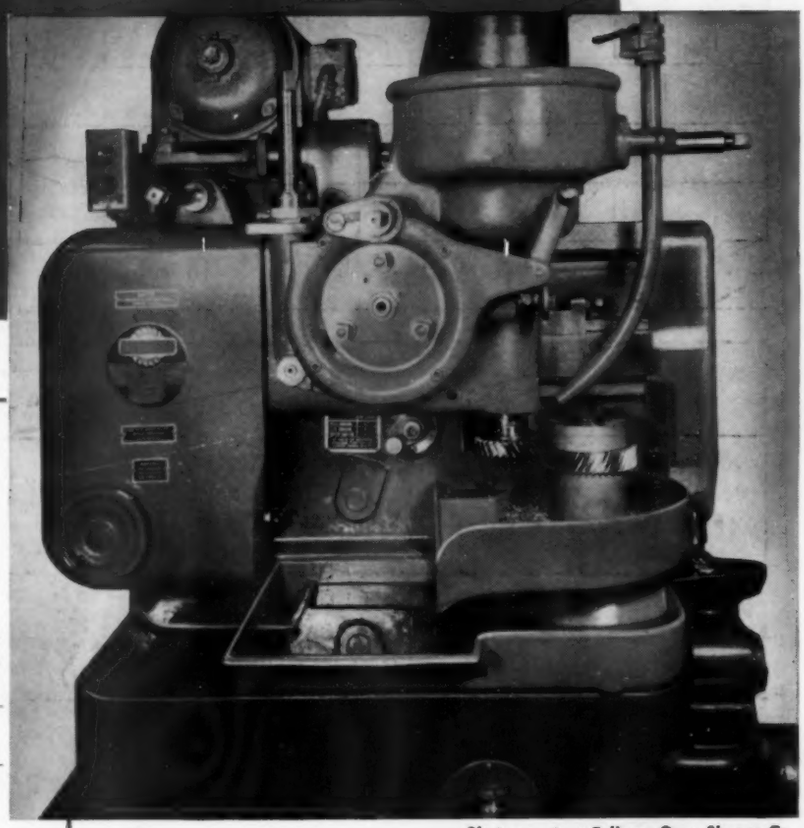

Photo courtesy Fellows Gear Shaper Co.

THE JOB:
Cutting automotive transmission gears, 8-10 pitch, 14 and 19 teeth.

THE MACHINES:
Two high-speed Fellows Gear Shapers.

THE RESULT:

	No. Gears cut per tool grind	Cutter stock removed in regrinding	No. gears cut before scrapping cutter
Competitive Cutting Oil	26	0.018"	504
Texaco Sultex Cutting Oil	32	0.011"	1017

Permissible stock removal 0.350" before scrapping cutter.

To improve cutting performance and machine tool output and to reduce costs on jobs like the one illustrated, and many others, use *Texaco Sultex Cutting Oil.*

Texaco Sultex Cutting Oils are carefully compounded, active oils that permit increased speeds, feeds and depth of cut, yet assure improved surface finish and longer tool life.

These benefits pay off in higher output per machine and lower unit costs of production.

Sultex is only one of a complete line of *Texaco Cutting, Soluble and Grinding Oils* designed to do all your machining jobs better, faster, at lower cost.

A Texaco Lubrication Engineer specializing in cutting operations will gladly help you select and use the right cutting fluids to give you best results on all your work. Just call the nearest of the more than 2500 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, SOLUBLE AND GRINDING OILS FOR FASTER MACHINING

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

As Important as "The Bomb"

In assessing our defense resources, we should avoid the mistakes of World War II.

The military mind then thought of our needs almost exclusively in terms of end products. The generals and admirals wanted planes, ships, guns, tanks. They forgot in large measure about the specific industrial facilities which make possible the production of these items.

It was hard to make them understand that defense weapons in the quantities desired were not obtainable without plenty of machine tools, stamping presses, welding machines, forging machines. And without lots of castings, steel, aluminum, other materials, and ball bearings.

As shortage after shortage occurred, this fundamental fact was driven home. When war ended, industry had proved beyond question that its resources are as basic to defense as fighting men themselves.

Now we are busy on plans for rebuilding some of the defense forces so hastily demobilized after the war. We rightly are calculating our strength in numbers of air groups, for instance, made up of bombers and fighters.

But, again, let's start at the beginning and not at the end. We can't get the bombing and fighter planes we want without the necessary raw materials. Then the raw materials must be processed into parts and subassemblies, which in turn are put together into end products.

It all calls for a fine balance of raw materials, machines, plant facilities and manpower. Along with this indispensable foursome goes that indefinable but invaluable factor which we label "know-how." Fortunately, we have more of it than any other country in the world.

These precious possessions are what makes America strong. Russia doesn't have them. Her lack of them is good reason for believing that she will go only so far and no farther if faced by a determined America.

Let's not underestimate them. They are as much an integral part of our national security as are atom bombs, guided missiles, huge bombers.

That is why we should accumulate an adequate stockpile of critical and strategic materials. That is why each industrial plant should know what it is to do in a national emergency. That is why we should have a virile machine tool industry and enough capacity to make other kinds of metalworking equipment essential to our defense.

America's future safety rests as much with her industrial resources as with her military establishment. In all our planning, we should keep that fact in the front of our minds.

Burnham Finney

EDITOR

SHEARING
the clean-cut way!

This ¾-inch shear is cutting plate rapidly and accurately with a sharp reduction in cost over other methods.

The 36 or 48-inch micrometer back gauge is a valuable time saver for cutting plate to size. To accommodate extra long plates, the Cincinnati back angle swings up out of the way.

When it is desirable to shear to a scribed line, the Cincinnati light beam gauge positions the plate rapidly and accurately.

Plates roll easily across Cincinnati tables on ball transfers, cutting handling time and physical effort.

Cincinnati inclined rams present the corner of the knife to the work and shear straight and clean.

Cincinnati features ensure quick handling, accurate work and low shearing costs.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Wax-injection apparatus developed recently by Allis-Chalmers engineers uses Alemite 7701-K high-pressure barrel pump to force melted Zyrox 51-30 wax from storage tank through hose lines to nozzles. Mold for wax pattern is held on bench by air clamp while nozzle injects wax through Zerk fitting. Hot-water jackets surround machine's wax storage tank, pump and hose lines to keep wax at best injection temperature

Foundry Methods Improve INVESTMENT CASTING

BY KENNETH R. GEIST, TECHNICAL ENGINEER IN CHARGE
PRECISION CASTING SECTION, ALLIS-CHALMERS MANUFACTURING COMPANY

PRECISION investment castings are made at Allis-Chalmers' West Allis Works by the familiar "lost wax" process. But methods research carried on since we started casting buckets for aircraft turbo-supercharger rotors in 1943 has resulted in important improvements in procedures. These include special machines for injecting wax into pattern molds, and the adoption of foundry techniques heretofore not used for making investment castings.

Use of 35-lb. capacity induction melting furnaces, in place of smaller furnaces for melting individual flask loads of metal, makes possible more accurate metallurgical control of alloys to be cast. Alloying is done as melting proceeds, in line with normal foundry practice. In addition, melting of larger batches permits pouring several flasks from the same ladle load. This makes possible considerable reduction in casting production costs. At present, four induction melting furnaces are installed and the plant can pour economically up to about 100 lb. of metal per hour. Space is available for expanding facilities to approximately three times this production rate.

Precision investment casting techniques are not new to Allis-Chalmers' engineers. In 1943 we installed equipment capable of producing 600,000 supercharger buckets a month. During the rest of the war literally millions of these precision-cast blades were made. To insure getting into production quickly the original equipment installed for investment casting was copied after that in use elsewhere. But efforts to improve the process were begun almost immediately. In 1944, the company

set up a small pilot plant in its research laboratories to study the application of investment casting to other war products.

Soon after the end of the war, the company undertook a study of the extent to which the experience and theoretical knowledge obtained from its wartime precision-casting operations could be applied economically to its peacetime products. As a result, Allis-Chalmers decided to remain in the precision investment-casting field and started work on its recently completed plant.

To date, experience shows that almost every castable alloy can be handled by our procedures. We have made satisfactory castings of aluminum alloys, 85-5-5-5 brass, aluminum and manganese bronzes, several grades of cast iron, several types of steels and such high-temperature alloys as Vitallium and Allegheny Ludlum's No. S-590 alloy. Among steels cast are low-carbon steels like NE-8620, heat-treatable steels like SAE-3140, tool steels and stainless steels of several types.

Wax pattern is removed from dismantled mold after solidification and placed in paper-lined tray. For best results, mold sections are cooled on plate kept cold by block of "dry ice" between wax injection cycles. Mold shown has soft-metal cavities cast in cast-iron flask blocks. Not as satisfactory as more expensive all-steel molds, soft-metal cavity molds are easier to make and permit the shop to get an order into production quickly

Where wax-pattern requirements are high, they are cast in water-cooled molds in this automatic-cycle machine developed by Allis-Chalmers engineers. Operator removes completed patterns and lubricates molds (solution of alcohol and liquid soap) by hand. After operator depresses pushbutton to start cycle, molds are closed by 15-ton special Hannifin air toggle press, wax at 170 F. is injected under 1000-psi. pressure and allowed to cool, wax gun is refilled, and molds are opened automatically. Air cylinders for pulling cores are mounted on rear. On one typical part, production is up from 110 to 1000-1200 patterns per 8-hr. shift

Hardened wax patterns are delivered on trays to workbenches for inspection and assembly on specially designed wax sprues and gates with heated tools and melted wax. Sprue and gate assemblies must permit mounting patterns to get maximum number into each flask, support patterns in flasks during investment operations, permit proper drainage of wax as it melts out, and leave passages for proper distribution of molten metal during pouring operations. Often several sprue and gate designs must be tried before a satisfactory one is found and a difficult casting problem is solved

Each assembled "tree" of wax patterns is dipped in a primary investment slurry made up of very fine silica and a liquid binder. While this coating still is wet, a slightly coarser silica is sifted over the pattern and sprue surfaces to increase coating strength and to provide rough surface to which secondary investment material will bond readily

Wax "tree" is mounted on steel flask bottom plate with wax, then stainless steel (18-8) flask lined with waterproof paper is positioned and sealed to plate with hot wax. Flask then is filled with wet secondary investment and placed on vibrating table for 30 to 45 min. to settle and pack investment material. Then, excess liquid is decanted and flasks are stored at room temperature for 10 hrs. or more while investment sets

Removal of wax from investment mold is started on 200 F. steam table near loading end of this pusher-type oven. When most of wax has been drained to tank under steam table, flask is placed on tray for 5-8 hr. trip through furnace. Up to four flasks go on each tray. When removed from furnace for transfer to pouring table, flask has been soaked through at 1850 F. for several hours to burn out any remaining wax, and preheat investment for proper pouring conditions

Metal for casting is melted in 30-kva., 9,600-cycle induction furnaces of 35-lb. capacity each and is transferred to pouring table by hand ladle. Accurate metallurgical control is made easier because of relatively large melts. Alloying elements are added as melting proceeds

(NEXT PAGE, PLEASE)

Conventional gravity-head pouring is used in almost all cases, the relatively large melts making it possible to fill four or five flasks from a single ladle in some cases. Present capacity permits pouring up to 100 lb. of metal per hour. Flasks are placed on sand-covered table which can be turned by hand for convenience of pouring crew

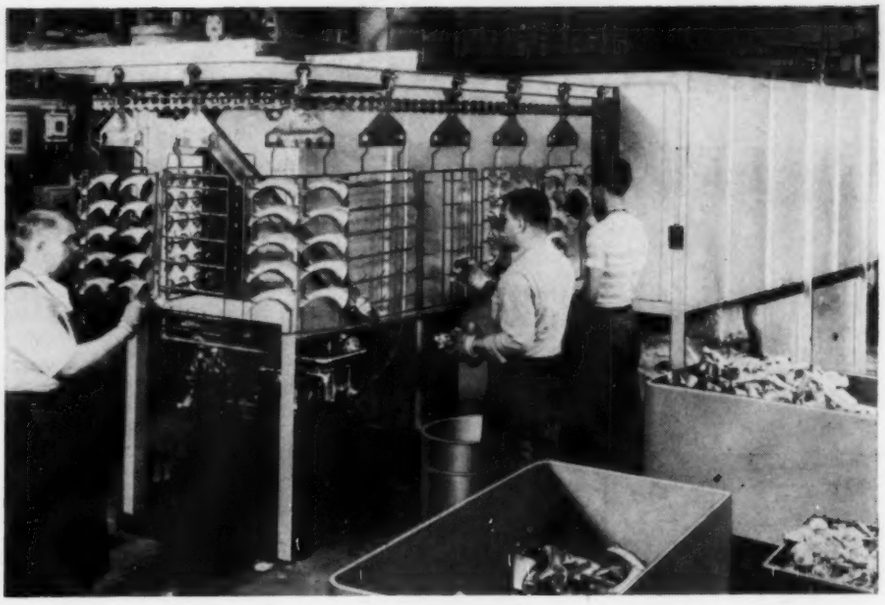
After cooling (5 hr. or more) castings are removed from flasks with air hammer. Flask is held on rack with vertical air clamp during this operation. Hood surrounds table rack to minimize scattering of dust. Remaining investment material is removed in a small Wheelabrator or by sandblasting in a Pangborn cabinet

Individual castings are cut free from "tree" with special Grob high-speed bandsaw or with Delta circular friction saw. Some hard-to-machine alloys require special cutting procedures

Gate Surface → is smoothed and some castings are polished at bench grinders in the finishing department. Most of the castings are small and easily handled

Each casting is checked carefully by an inspector for dimensional accuracy and surface quality before shipment. Shown are sewing-machine and turbine parts now in regular production, as well as a number of try-out jobs being put through the department for Allis-Chalmers research as well as for prospective customers

OLD METHOD.. Hand dipping was too slow, different materials had to be segregated



NEW INSTALLATION.. Parts are hung on conveyor hooks or placed in baskets, traverse the continuous Sunbeam Stewart Bonderizing machine in 20 min., thus avoiding tie-ups

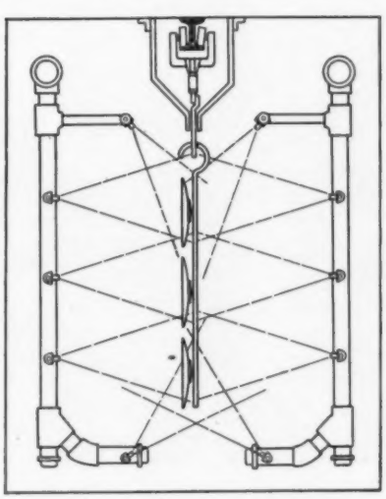
CONTINUOUS BONDERIZING DOUBLES OUTPUT

BY J. W. LYNCH, Senior Vice President, Sunbeam Corporation

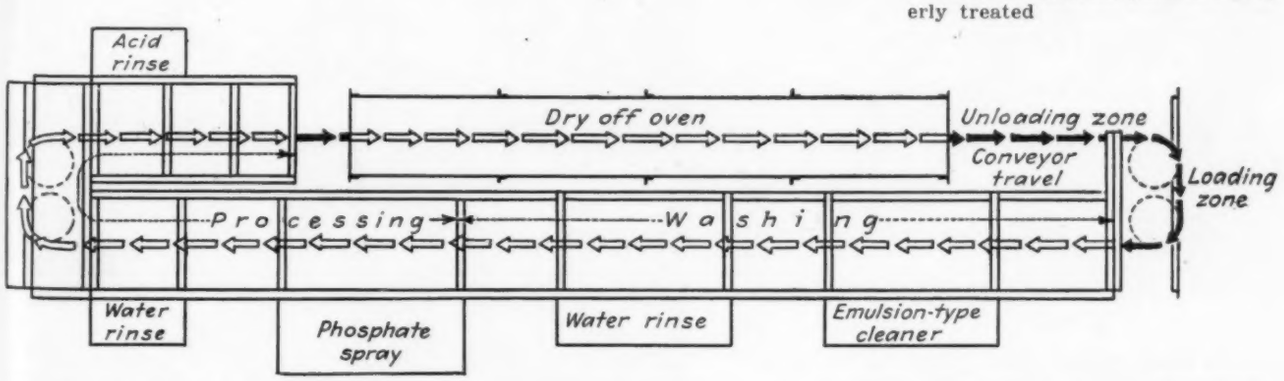
OUR electrical household appliances and lawn sprinklers require a number of steel stampings, also aluminum and zinc diecastings, that are painted. To cleanse the metal and promote better adhesion and durability of the paint, our practice calls for Bonderizing these parts.

Application of this treatment by hand dipping in various solutions is no longer economical, because of increased production requirements. For this reason, we have installed a Sunbeam Stewart continuous Bonderizing machine, together with an overhead monorail conveyor system to carry the parts through several spray chambers and a dry-off oven. The entire cycle now requires only 20 min., and the unit does in 12 hr. what formerly took 24 hr. Thus, we have doubled the rate of metal preparation and have improved working conditions at the same time. Besides, manual effort is reduced.

From the drying oven, the conveyor carries the work to an unloading platform where it is transferred to trucks for delivery to the painting department.



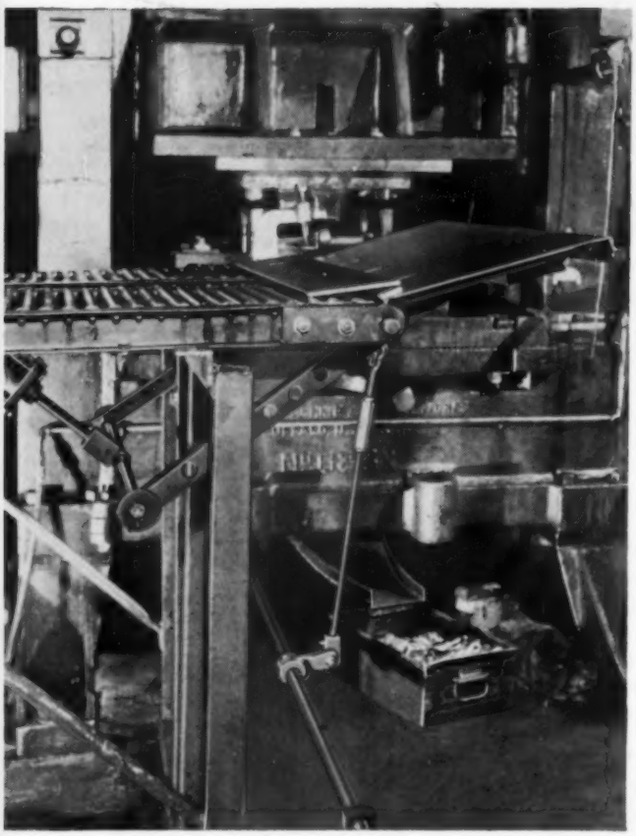
Spray nozzles are spaced so that all surfaces of different parts are properly treated



WHAT MACHINE DOES.. Conveyor carries work through five spray zones and a drying oven. Sprays are: 1—solvent removes grease, oil and drawing compound; 2—hot water rinse; 3—Bonderite solution produces phosphate coating; 4—cold rinse; 5—Parcolene or chromic acid and phosphoric-acid rinse

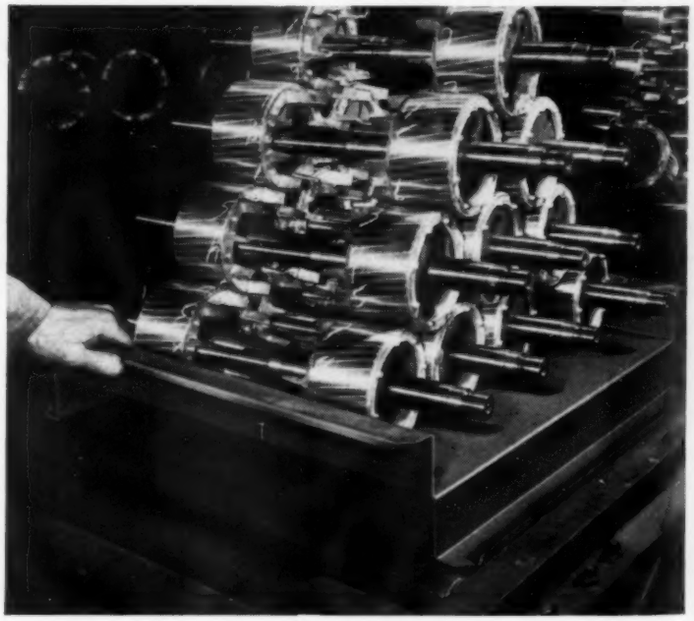
WORK-HANDLING DEVICES

Simplify Motor Manufacture



Air cylinder tilts sheet-steel shelf in front of Niagara press to move stator-frame plate onto roller conveyor for delivery to nearby coining press. Frame plate is cut to length and punched in press shown, later cold-rolled into circle. Operation of tilting shelf is interlocked with motion of press ram for automatic sequence of operation

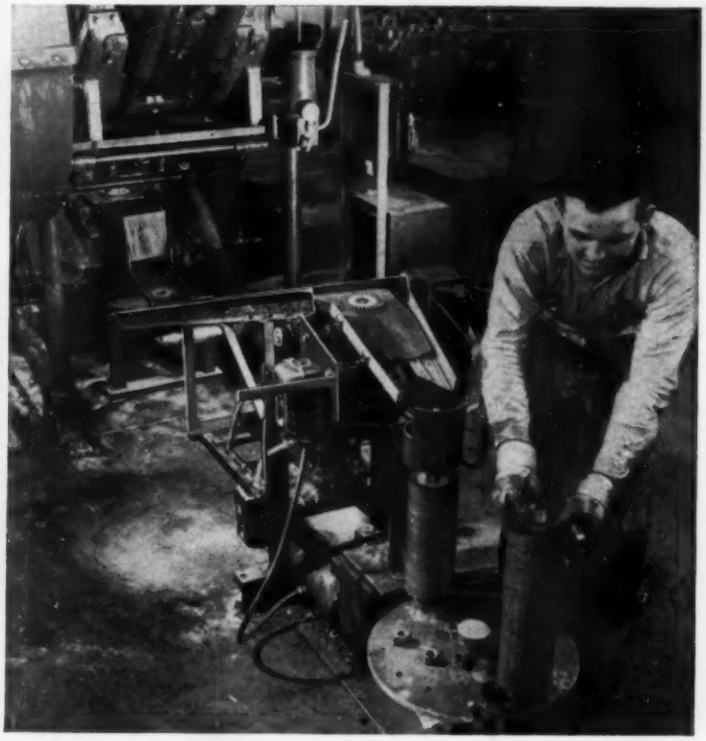
Air lift with roller top raises wound stators for Life-Line motors at Westinghouse, Buffalo, to correct height for hooking onto a Jarvis-Webb overhead chain conveyor which carries stators through series of baking ovens and thermoset varnish dips for insulating the coils. Foot valve provides easy control of lift, leaving operator's hands free for handling stators delivered by roller conveyor at right from winding and connecting groups



Reversible sheet pallets 23-in. square carry rotor and shaft assemblies on 24-in. wide roller conveyors. Pallets also can be handled with standard lift trucks, stacked easily when not in use and used with either side up

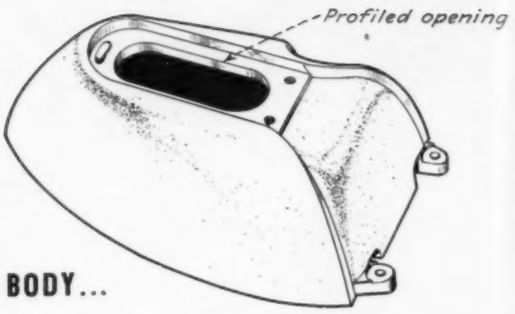
Motor frames, slot cell insulation, stator coils, face insulation and wedges are matched and distributed to winding positions by this carrousel conveyor which moves continuously at 32 fpm. Winders at work benches, spaced along each side of the carrousel, slide assigned stators from conveyor onto bench as needed. Each carrousel carrier has roller conveyor surface for easy transfer of stators. Finished stators are moved back onto conveyor for transfer to lead-brazing section

Pin-type racks on special caster trucks hold finished brackets for Life-Line motors. Each rack holds 300 brackets and is easily moved to motor-assembly area as needed. Racks are loaded directly from bearing finish-boring machines, eliminating much rehandling



Rotor laminations are moved from under inclined punch press to automatic stackers with power-driven belt conveyors. Laminations are stacked 18 in. high, then bolted together for transfer to rotor die-casting group

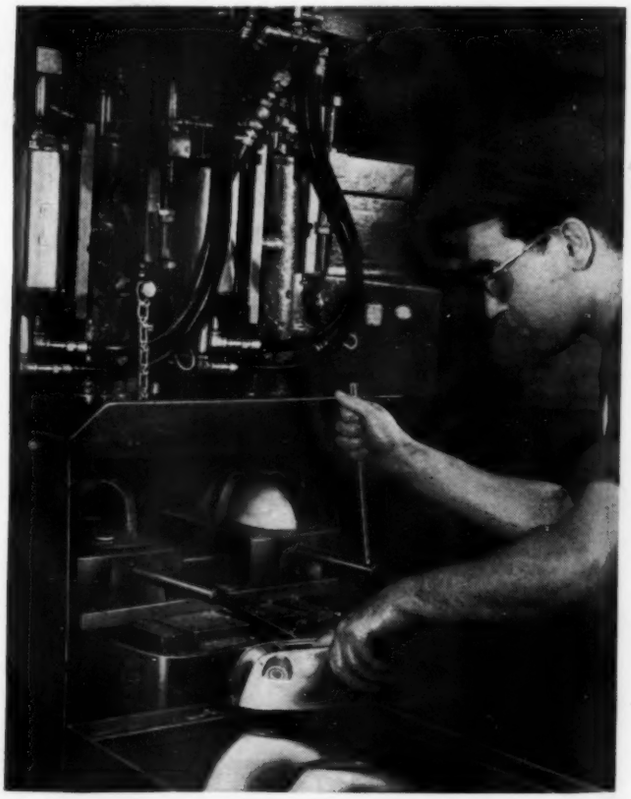
Ingenious Equipment



THIS IS THE SILEX STEAM-IRON BODY...

First operation on the tank is grinding the bottom flat on a Porter Cable belt grinder. Production rate is 180 pcs. per hr. The cored opening in the tank is slipped over a post on the fixture. Table infeed is powered by a hydraulically checked spring to apply the work softly to the fast-moving belt. Even so, considerable power is required to drive the belt at proper speed. For this application a 10-hp. motor is needed

Power clamping by means of Bellows air cylinders assists the operator. In this setup, the tank bottom is slipped underneath a locating plate. With the piece lightly held in position, the operator trips the air control lever. Thereupon, the front V-block moves into position, pushing against the nose of the tank and forcing it against a rear stop. In timed relationship, the rear V-block rises to clamp the rear of the tank. With the work securely clamped, the operator hand feeds the multiple-spindle drillhead to drill two No. 13 holes in the ears at the rear of the tank and to counterbore a 17/32-in. hole in the bottom. These three holes, together with the previously ground bottom, are used for subsequent location purposes



To mill out a cored pocket to receive the tank cover, tank bottoms are milled two at a time on a double-spindle Morey profiler. Pieces are loaded into cam-operated vises. Then the operator trips a control which causes the two heads to feed the 1 1/32-in. carbide-tipped end mills (40,000 pcs. per grind) to depth. Next, a second control is tripped to cause the table to advance. When the stroke is complete, both the heads and the table return simultaneously to their starting positions. Feed control by Bellows air equipment so reduces the time and effort required that production averages 260 pcs. per hr., as compared with 130 pcs. per hr. with hand feeding, and the operation is not a bottleneck

Modifications Increase Production

BY RUPERT LE GRAND, ASSOCIATE EDITOR

WHEN seeking to capitalize quickly on the market possibilities for a new product, it is often expedient to use existing equipment. And then by exercise of ingenuity, it is possible to exceed normal output by these machines as originally built.

This practice was followed with considerable success by the Silex Company when it introduced a steam iron. The principal setups for three aluminum-alloy components—the tank, the tank cover, and the steam valve—will illustrate the principles.

Steps taken may be summarized thus:

1. Line production was established for each component.

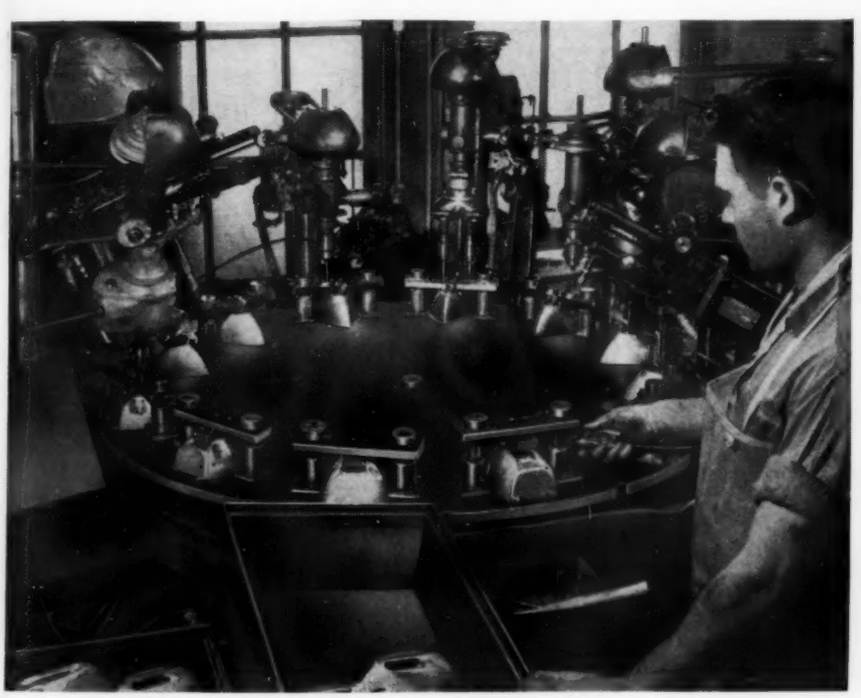
2. Hand millers were converted to semi-automatic machines by application of Bellows air feeds and cylinders to control table movement and collet operation.

3. Inexpensive drilling and tapping machines were created by mounting Buffalo drills on tables. In most instances these machines have pedal-controlled Bellows air feeds for spindle actuation, so the operator's hands are free for loading and unloading fixtures.

4. Similar equipment was combined into a station-type machine that does the work of a special-purpose machine which would have cost four times as much and required many months for delivery.

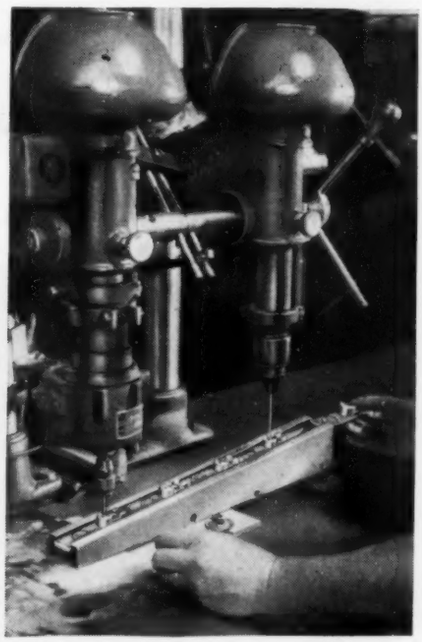
5. Special drills, taps and carbide spotfacers were developed for working on aluminum alloy.

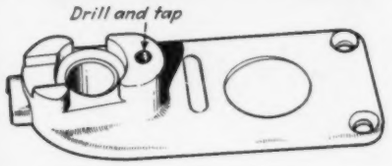
As a result of these several moves, the output from most operations is two to three times greater than would have been expected from the equipment available at the start of the program. And because of these results and the absence of operator complaints, Silex has been able to mass-produce steam irons on an economical basis and meet the demand.



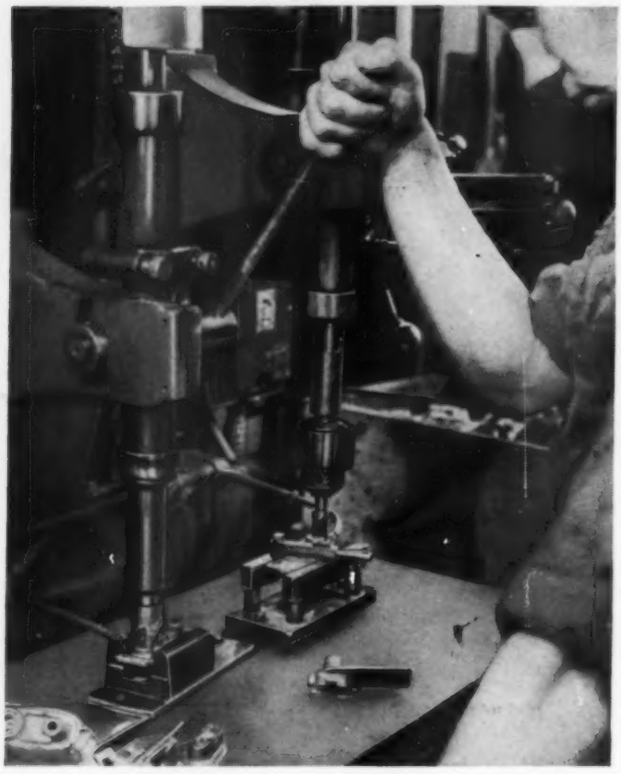
To drill and tap three holes for the tank cover and to face, drill and tap a hole for the steam valve, Silex engineers decided to build a station-type machine. Seven standard Buffalo drillheads are mounted in a circle about the indexing table. This machine turns out 1400 tank bottoms in 9 hr. and cost only 25% as much as a special-purpose machine. Table indexing, table locking accurately at 13 positions, and feeding and return of the seven drillheads are under the control of Bellows air equipment tied into an interlocked electrical circuit. The table will not unlock and index until all of the drillheads have retracted. The table is then unlocked, indexed and again locked by two cylinders. Finally, the heads advance, feed and return under control of electrically operated Bellows feeds with a hydraulic cushioning feature applied during feed

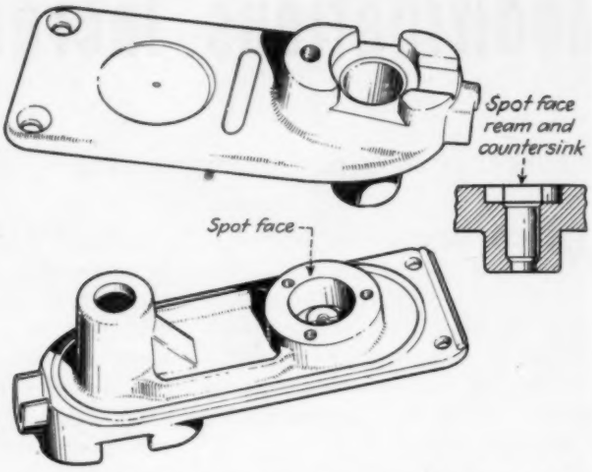
THEN THE TANK COVER...





Combination of a clever fixture and two Buffalo heads permits drilling and tapping a deep cored hole in the tank cover for a No. 8-32 thread. The inclined fixture retains four pieces between guides. Entry of a piece from the right pushes a finished part from the fixture. When the fresh piece is under the drill, the drilled hole in the fourth position is automatically brought under the tap. The drillhead and the tapping head are simultaneously fed to depth by pedal control of the feed pinions and returned by spring linkage. Production is 2000 pcs. in 9 hr.

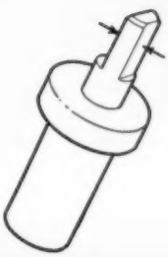




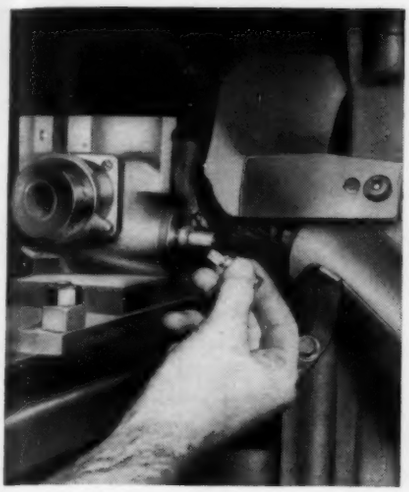
Spotfacing operations on opposite sides of the tank cover are performed within the time cycle of the longer operation by equipping one of the two Buffalo heads with a Bellows air feed and hydraulic cushion. The operator first places the piece in the right-hand fixture for facing, reaming and countersinking the cored steam-valve hole. These operations are performed with a carbide-tipped tool. Feed rate is cut in half automatically when the spotfacing portion of the combination cutter comes into contact with the work. After the fixture is reloaded, the piece is turned over (at left-hand fixture) for spotfacing the safety diaphragm seat with a carbide end mill

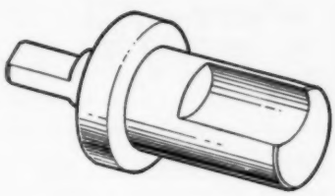
INTO THE COMPLETED COVER FITS THE STEAM VALVE . . .

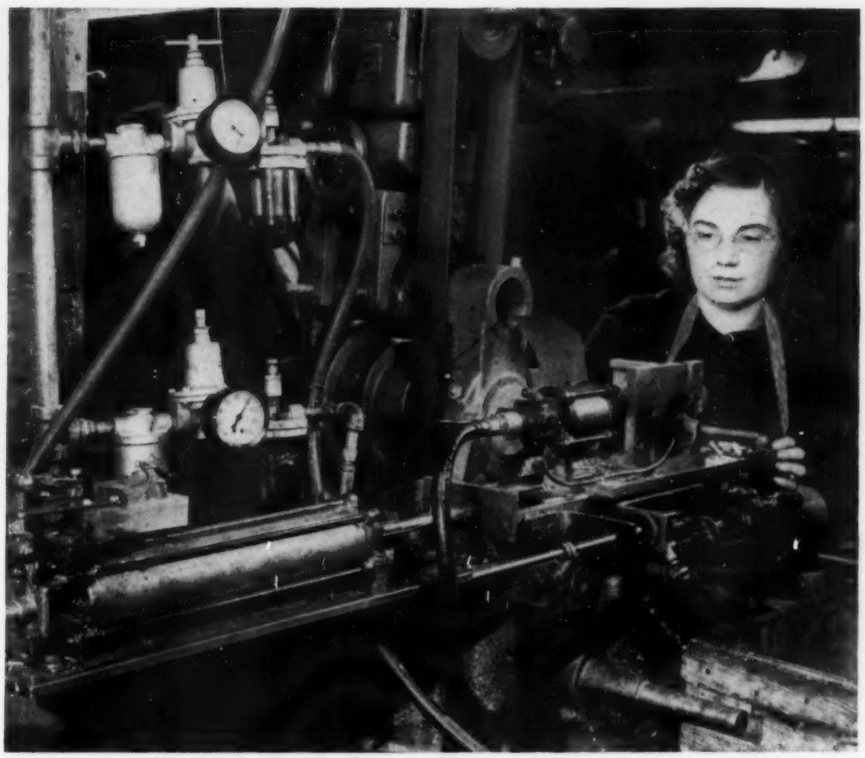
Three holes are tapped in the safety diaphragm, starting from cored holes. Spindle movement is actuated by a Bellows feed under pedal control. To save time involved in removing the fine chips from the tap, a Jarvis tap brush, operated by cam from the spindle stroke, sweeps off the chips before the tap enters the hole. This refinement reduces tap breakage



Two flats are straddle-milled on one stem of the steam valve. For this operation the piece is placed vertically in a collet chuck operated by a Bellows air cylinder. The exhaust kicks the finished part into a chute. Table feed is also air powered







To provide a steam escape, a longitudinal groove is milled into the larger stem of the steam valve. The piece is located in the collet chuck from the straddle-milled end. When the operator depresses a pedal, the table is rapid-traversed by a Bellows air feed to the cut; slowed to feed rate by a hydraulic cushion and then caused to dwell for a second against a stop. A hand miller and a motorized cone drive, plus the air equipment, thus produce 4000 pcs. in 9 hr. if required, but if not the operator can be transferred to other part-time tasks

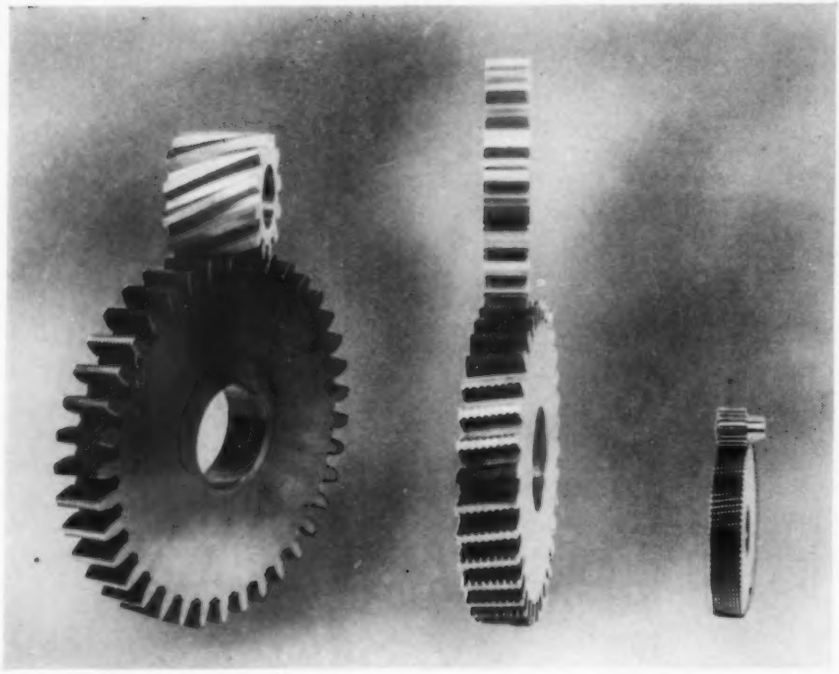
"Tonight we hold our graduation exercises in the shop school!"

Tips FOR TOP SHOP MEN

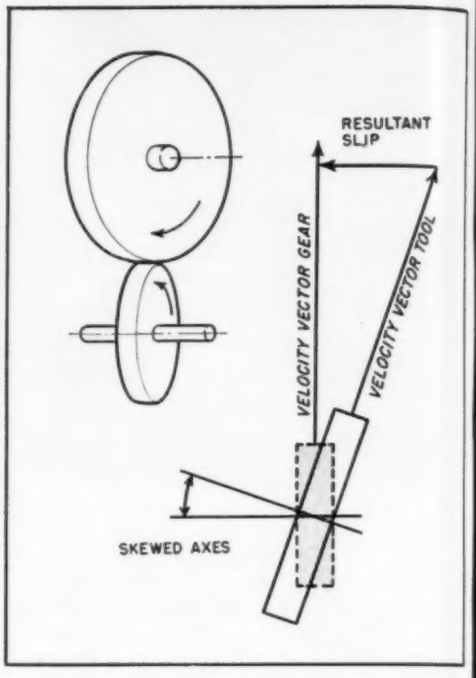
236 When a subordinate helps you to prepare something to go "up the line"; be sure you give him credit, no matter how insignificant his contribution. Remember when the Big Wheel "stole" *your* ideas?

237 It is frequently more dangerous to blow off steam about business to your wife than to a stranger. The stranger may be a stockholder, but your wife may discuss the problems in all sincerity with her best friend, who has a friend, who has a friend, who . . . until everybody in the company, above and below you, knows how you feel about that problem. And, worse still, such stories gain in the telling. If you must talk, talk to the dog—real "talking dogs" are rare.

238 It's time, apparently, to repeat the injunction to mind your own business about military business. If you have anything to do with a secret order, keep it secret. Remember, a "secret" is a fact communicated to *no* people.



1 The axes of the cutter and the workpiece are skewed to each other to produce a cutting action by slippage along the tooth surfaces



2 Vector diagram, indicating the nature of the crossed-axis slippage produced by rotating the gear and tool tightly meshed together

HOW GEAR SHAVING WORKS

Increasingly popular as a means of finishing gears, shaving is a relatively simple process when its basic principle is understood

BY SIDNEY CORNELL
MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

GEAR-TOOTH shaving is a process in which a small amount of material is cut or shaved from the working tooth surfaces of a gear to obtain greater accuracy and better finish. Various widely differing methods of shaving have been developed or are in process of development. At the present time, however, shaving with a rotary tool or cutter on an axis skewed with that of the work is by far the most frequently used method.

In this article, only the rotary, skewed-axis method will be considered, as applied to spur and helical involute gears. A spur gear may be regarded as a helical gear with a helix angle of zero, consequently all reference to helical gears will be assumed to include spur gears.

The rotary shaving tool is a hardened, accurately ground helical gear, the tooth surfaces of which have been serrated to provide cutting edges. The tool is made with a helix angle differing from that of the gear being shaved. Thus, when the tool and work are tightly meshed, the axes of rotation are skewed to each other, or, in the terminology of the art, the axes are crossed.

When the gear and tool are rotated together, crossed-axis slippage takes place along the tooth surfaces. The serrations or grooves on the tool are made approximately normal to the direction of crossed-axis slippage so cutting of the mating gear tooth surface results.

The nature of the action between mating involute helical gears on skewed axes is such that each pair of working tooth surfaces will contact each other at a given instant at one point only. When the gears are rotated to a position where the single point of contact lies on the common normal to the skewed axes, this is called the crossed-axis point. Total contact on a tooth surface is a line passing through the crossed-axis point and extending from the lowest point of contact to the tip of the gear.

True Involute Produced

If one of the mating pair of gears is a shaving tool, the total line contact will broaden, as cutting takes place, into full surface contact across the working faces of the teeth being cut. The tooth surface thus produced on the work

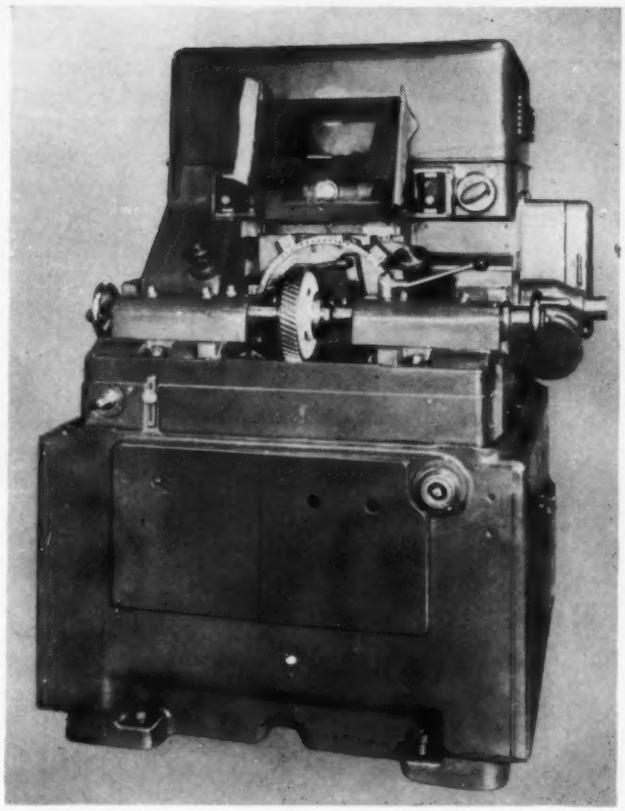
will have a true involute on the section passing through the crossed-axis point, and will be slightly distorted toward the outer faces of the blank. A lead check will show that the tooth is concave or hourglass shaped. To produce a true involute over the entire tooth surface and to eliminate the hourglass shape, it is necessary to feed the gear along its own axis, or to move the axis of the tool with respect to the gear so that the crossed-axis point traverses all, or nearly all, of the face width of the gear.

The Shaving Machine

From the above it may be seen that the shaving machine must provide: (1) axes of rotation for the tool and work, (2) a means of adjusting the angle of skew (crossed-axis angle) to meet the particular conditions encountered, (3) a means of adjusting the inter-axis distance to accommodate various sizes of gears and tools, (4) a means of rotating the gear and work at speeds desired, (5) a means of feeding the crossed-axis point across the face of the gear, and (6) a means of feeding the tool into the work to permit cutting. In addition it is necessary to provide a means of adjusting for taper which may result from uneven cutting of the tool or other causes, and to have a means of directing coolant on the cut.

In one type of machine the direction or sense of the axis of rotation of the work is fixed with respect to the machine bed. The work is held between live centers, and the axis of rotation of the tool may be adjusted to any desired angle of skew with respect to the axis of the work. The tool is mounted on a spindle held on bearings in the mechanism which provides the skew adjustment. The inter-axis distance is adjusted by means of a screw and nut which moves the tool head with respect to the work, to accommodate various sizes of work and tools.

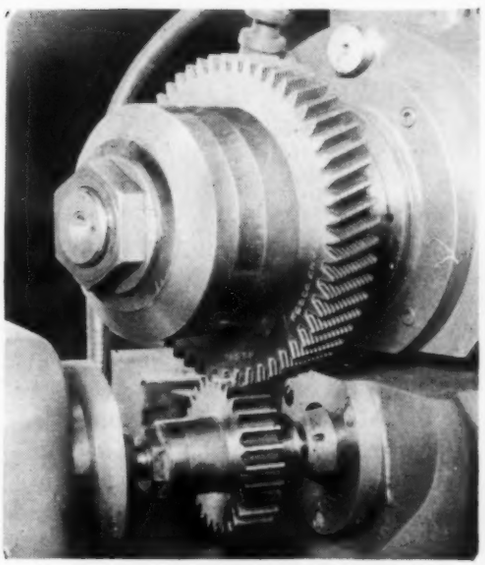
There is no coupling between the tool and the work other than their own mesh. Consequently, the land between the grooves of the cutter is relied upon to control the action.



3 Typical crossed-axis gear shaving machine

Rotation of the tool and work is accomplished by driving the tool, which in turn rotates the work. The tool is driven by an adjustable-speed electric motor through V-belts and gears. The crossed-axis point is passed back and forth across the face of the gear by moving the tool head parallel with the axis of the work. The rate of feed is controlled by change gears from the tool drive. On this particular machine, an even number of passes (such as 2, 4, or 6) is made. To keep the crossed-axis slippage in the same direction as the feed, direction of tool rotation is reversed at the end of each pass.

The tool is fed into the work by reducing the center distance, thus causing cutting to take place on both sides of the teeth at the same time. To feed the tool into the work as cutting takes place, a cam is provided. To facilitate loading, the cam has a knockoff position, which permits a considerable amount of backlash between tool and work. When the machine is started, the cam rotates to a position giving a tight mesh between tool and work. At the end of each pass, the cam forces the tool and work closer together by a prescribed amount.



4 Close-up of cutter and workpiece, showing one method of holding the cutter and workpiece

When cutting is completed, the cam returns to the knock-off position so the work may easily be removed from the machine. Taper is corrected by tipping the work table slightly with respect to the movement of the tool head. By exten-

FIG. 5

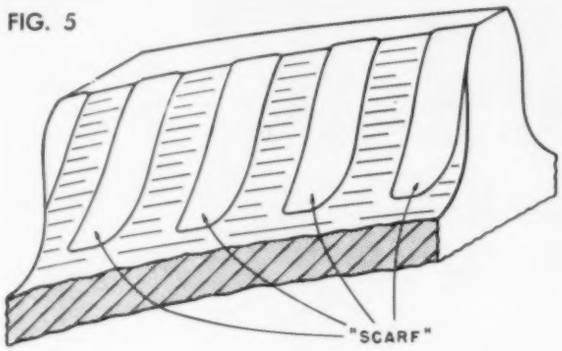


FIG. 6

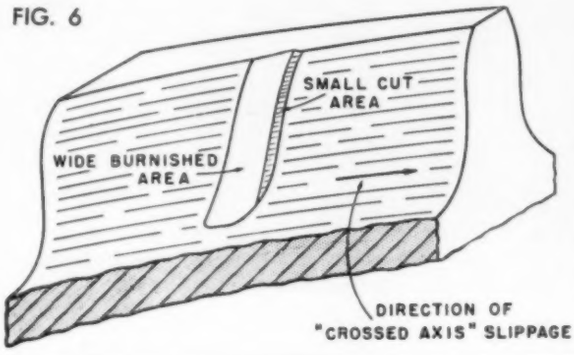
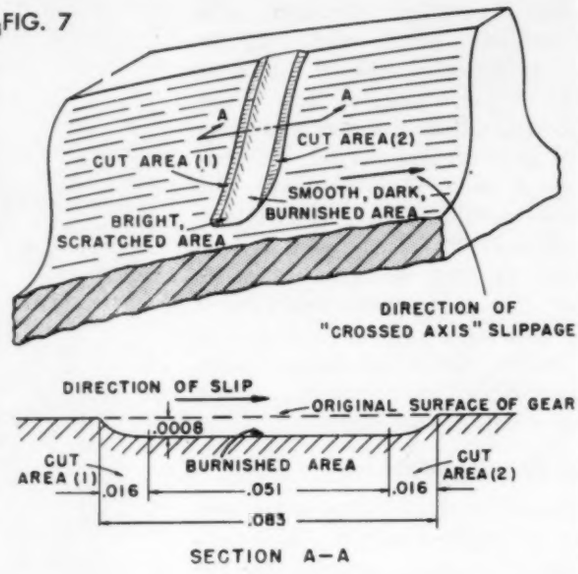


FIG. 7



5 Partly shaved left-hand helical gear tooth, showing the scarves made by contact of tool lands with work

6 Nature of the cut is indicated by the burnished band and small cut area produced by turning the tool through only one or two revolutions

7 Running for an appreciable time will produce fairly deep scarves with a cut area on both sides of the scarf

sion of such an arrangement of synchronization of table tipping with position of the tool head, crowning of the teeth may be obtained. Coolant is circulated through filters before being directed on the work, as the fine hairlike chips produced by shaving would have a harmful effect on the finish produced, and under some conditions may weld themselves to the edges of the tool with obvious results. Other methods of accomplishing the essentials of rotary shaving are incorporated in other types of machines, but these will not be discussed here.

*Fundamentals of the Cutting Action**

Ordinary rotary crossed-axis shaving depends on center-to-center pressure between tool and work, and crossed-axis slippage to provide cutting. The actual mechanism of cutting, however, is somewhat obscure. The question often is asked, "What makes it cut?" It is not self evident that a blunt tool with a 90° cutting edge should cut effectively under pressure. The action has been likened to that of a scraper with a 90° cutting edge, but the only similarity is in the edge.

The process of cutting may be analyzed as follows: Fig. 5 shows a partly shaved tooth of a left-hand helical gear. The scarves shown are produced by the contact of the lands of the tool with the work. Cutting was produced by rotating the tool in mesh with the work as in normal shaving, but with the cross feed kept to zero. The tool used was one in which the cutting edges on one tooth are in the same planes (normal to the axis) as the cutting edges on all other teeth. This means that contact with the work will be identical, regardless of the ratio of tool to work. Thus a picture of the cutting action independent of feed may be had.

Due to the effect of the crossed-axis angle and other factors, the scarves are not straight up and down in either the normal or diametral plane. If the tool and the gear are rotated together by turning the tool in the machine a few times with a wrench, the scarf will be a burnished band with a small cut area at the end toward which slippage takes place, as shown in Fig. 6. The depth of the scarf below the surface of the gear is less than 0.0001 in. However, if the tool and work are run together for an appreciable time, the depth of the scarf will increase considerably. The appearance of this somewhat deeper type of scarf is different from the shallow type in that there is a cut area on each side of the scarf as shown in Fig. 7. The depths of cutting were determined from actual measurement on a lead checker. For the gear shown, a crossed-axis angle of 15° was used. The helix angle was 32° and the width of land on the tool was 0.040 in.

It seems probable that the cut area shown in Fig. 7 is produced

* Experiments on the fundamentals of cutting action were conducted by the author at the Fellows Gear Shaper Co., and company permission to publish the results of these experiments is gratefully acknowledged.

by the freely cutting leading edge of the cutter land which also produced the only sign of cutting on the shallow type of scarf. The burnished area is produced by the land of the tool mashing the metal down and swaging it toward root or tip of the gear, or under the cutting edge where it is removed by subsequent cuts. The cut area (1) is probably produced by the "butterknife" cutting action of the trailing edge of the land which forces the chips under the land and out along the involute, producing the bright scratched area. The burnished area and "butterknife" cutting action are obviously undesirable and can be eliminated (except in the initial stages of cutting) by keeping the feed for a given tooth on the gear to less than the width of the leading cut area.

Fig. 8 shows diagrammatically the nature of cutting action in a plane parallel with the direction of crossed-axis slippage. Nothing has been said about the effect of involute slippage on cutting, however. It is known that on the active pitch line no slippage up and down the involute will take place. As contact departs from the pitch point toward the tip or toward the root, involute slippage between the cutter and the work increases. The involute slippage at the tip of the gear may be several times greater than the crossed-axis slippage. Thus to keep the cutting components uniform, grooving should be approximately in the plane of rotation of the tool.

Very high quality finishes are obtainable by shaving. The finish should be a cut finish and not a burnished finish, in order to minimize subsequent distortion in hardening and other undesirable effects. The characteristic finish has very fine feed lines approximately in the plane of rotation of the gear.

Shaving Problems

Shoulder gears. Because the axes of the tool and work are skewed to each other, interference between the tool and a shoulder on the work can occur. Factors affecting this interference are: Height of shoulder with respect to the gear being shaved, diameter of shoulder, width of neck between gear and shoulder, diameter of the shaving tool, and crossed-axis angle. For a given design of gear and shoulder, the only variables which may be controlled to avoid shoulder interference are tool diameter and crossed-axis angle. Reducing tool diameter is not a particularly effective method of avoiding interference, but designing the tool for low crossed-axis angles permits shaving gears with very high shoulders and narrow necks. Crossed-axis angles as low as 1½° have been used, although under such circumstances special modifications of the tooth profile on the tool are required to compensate for the distortion produced by the reduced cutting action.

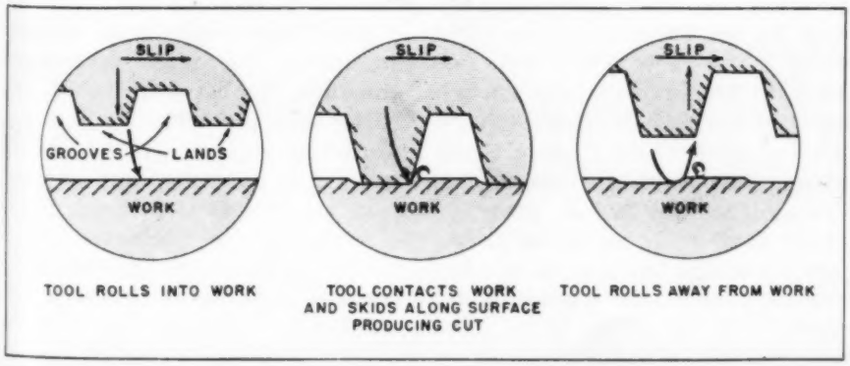
Ordinarily 6 or 7° crossed-axis angle is the lower limit for normal shaving. Designers would do well to bear this limit in mind for shoulder gears to be shaved. Methods of determining neck widths required on a new design for a given crossed-axis angle have frequently been discussed, and will not be described here. For gears in which the shoulder is not a problem, normal crossed-axis angles are from 10 to 15°. Higher than 20° is seldom used, as involute control on the work is lost.

As mentioned above, there is no coupling between the tool and the work other than their own mesh. It is therefore necessary to have the gears to be shaved in a reasonably accurate condition before shaving. The shaving operation then serves as a refining process.

Preparing Gears for Shaving. For gears in the neighborhood of 8 D.P., 0.001 to 0.002 in. of stock is usually left by the hobbing machine or gear shaper. As the shaving cutter does not shave the root or fillet of the gear teeth, it is necessary to use protuberance tip hobs or cutters in pre-shaving, so the fillet produced will blend with the shaved tooth surface. The protuberance tip undercuts the preshaved gear to approximately the amount of stock allowance to permit this blending. To obtain good results with protuberance tip hobs or cutters, it is frequently necessary to design them for somewhat more than standard depths of cut. This extra depth permits adequate undercutting without having the undercut extend too high up.

Life of Shaving Tools. The number of gears that can be shaved by a shaving tool before resharpening depends, among other factors, on the suitability of the feeds and speeds used, the type and condition of the coolant, the material and condition of the gear blank, the relation size of gear to tool, and the accuracy required. As an example, a transmission gear of 35 teeth, shaved by a tool of about 100 teeth, under conditions where feeds, speeds, coolant, and condition of the material were carefully controlled, was frequently handled in lots of more than 5000 to a high degree of accuracy, before resharpening the tool.

Dullness of the tool is characterized by a bright burnished finish and a distortion of the involute profile, as contrasted with the high quality cut finish and accu-



8 Cutting action of the shaving tool is indicated by these sections taken in a plane parallel to the axes of tool and work

rate involute profile produced by the sharp tool. As the tool becomes dull, the center-to-center pressure between the tool and work results in more and more stock on the tooth surface being displaced by the burnishing action of the tool lands as the cutting edges fail to cut the stock away. When the tool becomes very dull, the burnishing action becomes very great, flowing relatively large amounts of stock to other parts of the tooth and distorting the profile.

Resharpening the tool involves the application of well-developed techniques and is done by the tool manufacturer. It is accomplished by regrinding the working tooth surfaces of the tool. This, of course, results in a thinner tooth and a reduced center distance with the work. The lead on the tool is not changed in regrinding, and consequently the reduced center distance will result in a slightly lower crossed-axis angle. Because the involute system is a variable center distance system, accuracy of the involute profile on the work is not affected by the change in center distance. The number of resharpenings that can be given a tool before it is discarded depends on various factors which will not be discussed here. Six or eight resharpenings may be regarded as representative.

Hardening and Distortion. As the shaving process is a cutting process, the material of the gear-tooth surface must be in a condition suitable for cutting at the time of shaving. Steel gears which will have surface hardnesses on the finished gear of up to 40 or 45 Rockwell C, usually may be shaved after final hardening.

Steel gears which are to be case hardened, or any gears which will have a final surface hardness of more than 45 Rockwell C, must be shaved before final heat treatment. To obtain better tool life it is desirable to reduce the hardness at the time of shaving well below this top limit of 45 Rockwell C. Fully annealed gears, however, usually do not give as good results as those brought to the 20 or 30 Rockwell C range. When heat treatment occurs after shaving, a certain amount of involute distortion and change in tooth thickness is to be expected.

Except for gears having extremely thin webs or complicated blanks, the involute distortion and change in tooth thickness are of a uniform nature and can be allowed for in shaving. Also, it is possible to use special heat-treating processes which reduce distortion after heat treatment. When heat treatment occurs after shaving, special care should be taken to prevent damage to the final shaved tooth surfaces, either in the heat-treating process itself, or in subsequent cleaning.

Scrap, Properly Handled, Brings A Premium

BY C. W. CEDERBERG

TREASURER, LARSON TOOL & STAMPING CO.

HANDLING of scrap in the small stamping plant is important but troublesome. The major problem is to prepare the scrap to yield the highest price from the steel mills with the minimum of labor.

During the war, at the plant of the Larson Tool & Stamping Co., scrap was dumped in the yard until a considerable quantity had accumulated. Then a clam-shell bucket crane was hired to move in and clean out the yard and load the scrap without sorting. The return from scrap so handled was very small, but the shortage of labor precluded any other method.

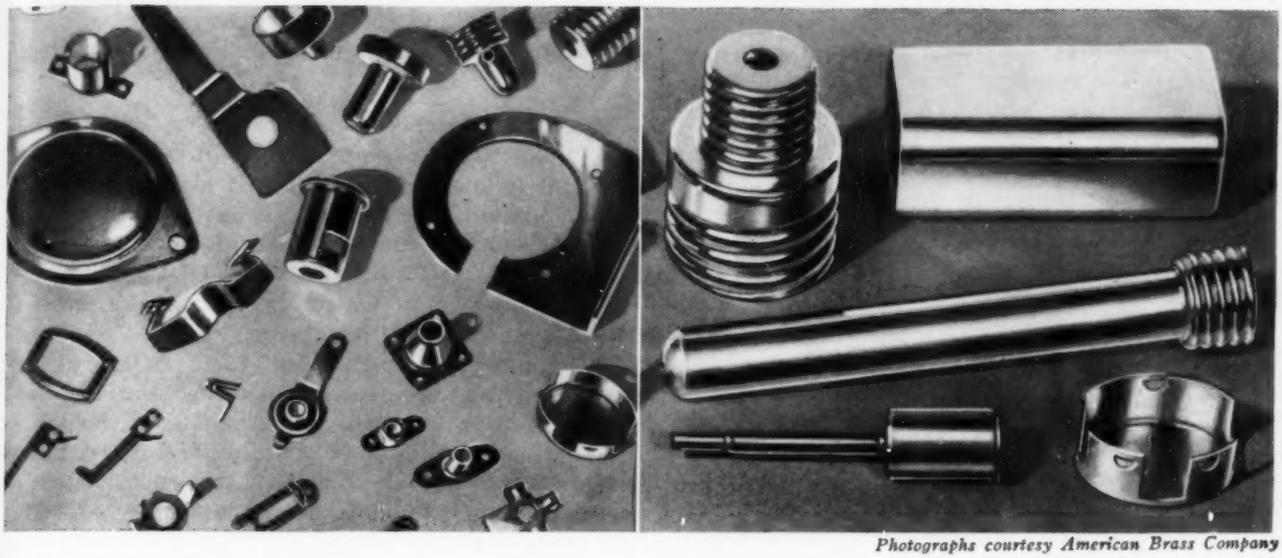
After the war, it became increasingly important to find a method of handling scrap to yield a greater return. As reported to the New England district meeting of the Pressed Metal Institute, standard baling equipment was investigated, but the investment required was so large that an adequate return could not be obtained on the amount of scrap produced. One method tried consisted of backing to the loading platform a trailer equipped with steel loops. Scrap from the presses was loaded over these loops in flat lengths to enable the scrap dealer to hook a crane into the loops and lift the whole load off the trailer in one operation.

It was felt, however, that this was not the ideal solution, and the problem was finally solved by fitting an old 50-ton A-frame press with a roll feed and shear. Behind the press is a pit large enough to hold a tote box on a carriage, the box being 6x4x5 ft. deep. Scrap from the operating presses is brought to the 50-ton press on stake trucks. These stake trucks are set at the left side of the operating presses, and when full, are moved to the scrap press. The scrap is fed through the roll feed and chopped up into short lengths to fall into the tote boxes.

When the box is filled, it is pulled into the yard by a tow truck to a yard hoist. In the yard is a small spur track on which 18 to 21 boxes can be stored, sufficient to fill a railroad car.

The tote boxes have projecting knobs on the ends below the center of gravity. A special bridle with a locking device allows the hoist operator to pick up a loaded box, and by removing a locking pin, cause it to tip into a car.

Apart from equipment already on hand, the total investment amounted to between $2000 and $2500. As the scrap now brings $14 a ton more than under the old method of handling, and as labor costs are only $3 to $4 a ton greater, there is a net increase return of $11 a ton. As approximately one car of scrap is produced per week, this means an additional income of $260 a week and permits amortization of the original investment in only ten weeks.



Photographs courtesy American Brass Company

How to Reduce Costs of
THIN METAL STAMPINGS

BY WALLACE C. MILLS

THE TOOL ENGINEER cannot escape the complexities of cost analysis in order to select tools and methods best suited to the quantities of parts required. He soon learns that his work does not stop with designing tools that will make the piece, or by emphasizing star performance on a single operation. Particularly in the field of thin-metal stampings, he finds it essential to establish "teamwork" among processes or operations, especially when line production is involved. . . . There is a method for making such an analysis. Besides, various techniques can be used to balance costs and reduce them in a number of instances. This special report represents considerable experience in investigating savings from tool designs and methods suitable to various speeds of output.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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TO FIND methods for speeding production of thin-metal stampings, start with a cost estimate (see sample). Costs depend on efficient use of materials, machines and labor. To determine the relative importance of these items for each operation, list the machines used, the number of operators, the output per hour, the blank size and material cost, and tool cost. Then append a summary of the cost per thousand pieces. With this information at hand, one can investigate costs under the various headings.

First, analyze the cost per thousand pieces from several standpoints:

1. *To figure the lowest contract price.* Costs are calculated "both ways" for different tools, also arrangements of machines to save operators.

2. *To meet competitive prices.* High-cost items will immediately demand attention and perhaps point the way toward improvements. For example, it may be seen that labor is being wasted, as when one operator stacks parts as they come from a machine and another feeds the stacked parts into a second machine. Trials may indicate that an arrangement can be put into successful operation, whereby one operator can perform both functions.

3. *To discover a more economical manufacturing sequence.* A product may have started as a small-quantity proposition, but has grown into a large-order business. Perhaps here the trick is to combine some operations on a faster machine.

4. *To demonstrate need for new equipment.* Management is convinced of the advantage of machine replacements only when it sees definite figures of savings per thousand pieces translated into economies on an annual basis.

5. *Changes in product design.* These may appear justified because wanted quanitities have increased. Anticipated changes may save operations, material or production time, and improve the product as well.

Second, make a more detailed analysis of the cost estimate, as follows:

For Operations:

1. *Study the sequence of operations.* Do the operations follow each other from a logical engineering standpoint? For example, an operation that must produce accurate dimensions should follow another that is likely to distort the work. Or the sequence may be awkward. Obviously, to make a drawn shell that requires threading on one end and has the bottom cut out, it is preferable to thread the open end first and then cut out the bottom, for two reasons: First, the shell can be handled easier with the bottom closed; and second, the shell is less likely to distort. Readers might say that such mistakes do not occur, but many just as obvious errors will be encountered.

2. *Combine operations wherever possible.* One of the most fruitful sources for savings is the combination of two or more operations on one machine to be served by a single operator. Wartime suggestion programs proved conclusively that combination of operations represents the largest single source of savings in manufacturing.

For Machines:

1. *What to consider.* Ascertain the quantity of parts to be produced, the cost of the machine, its burden rate and its production rate. Combine operations where feasible. Consider an automatic machine when part quantities are large or where it can lift production on a bottleneck operation.

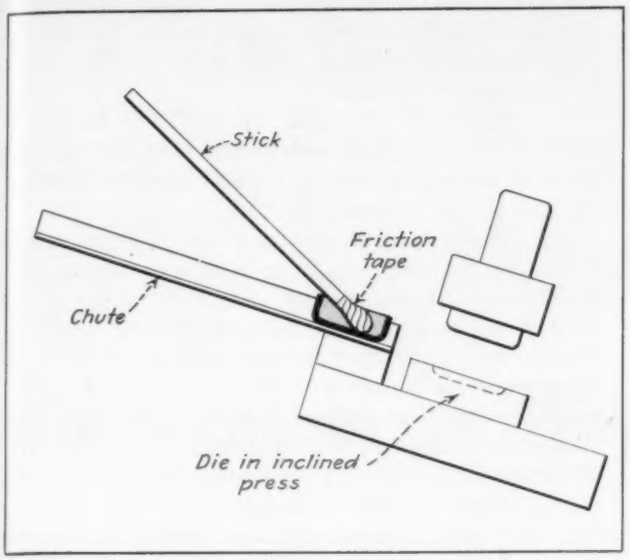
2. *Relate tool design to costs.* The burden rates applied depend on the cost system in use in the plant. Some factories apply burden directly to the machine; others set up burden according to departments. The practice in use will often make a differ-

Cost Analysis

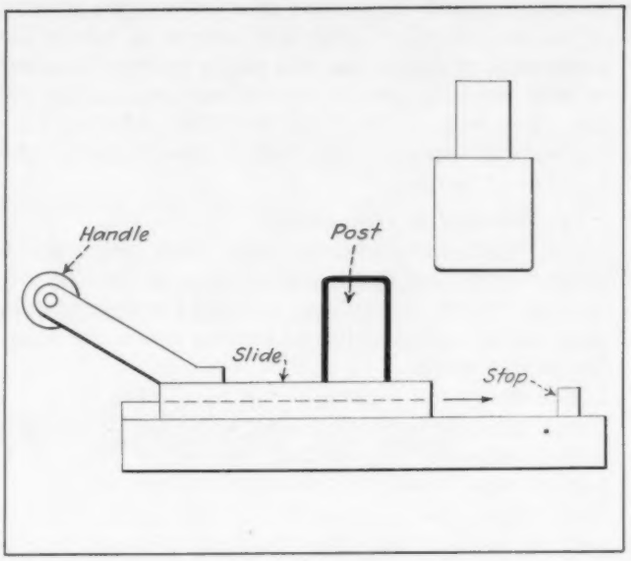
FOR MAKING A FLASHLIGHT HOOD (500,000 REQUIRED)

OPERATION	MACHINE	NO. OF OPERATORS	PIECES PER HOUR	MATERIAL AND BLANK SIZE	TOOL COST
Shear Strips	Slitter	1	1500 sheets	107# Black Plate 3.371 dia. blank 3½ in. wide strip	
Blank and draw	Press No. 20	1	4000		$400
Bead	Machine No. 34	1	1400	Use pull—through lay	100
Trim and thread	Machine No. 350	1	1900		150
Center blank	Press No. 18 with slide-feed die	1	3000		300
Wash and black oxide		2	8000	Material 0.15 per M	
Wax	Machine No. 466	1	4000	Wax 0.60 per M Packing Boxes	
Pack		1	4000		
				Total	$950

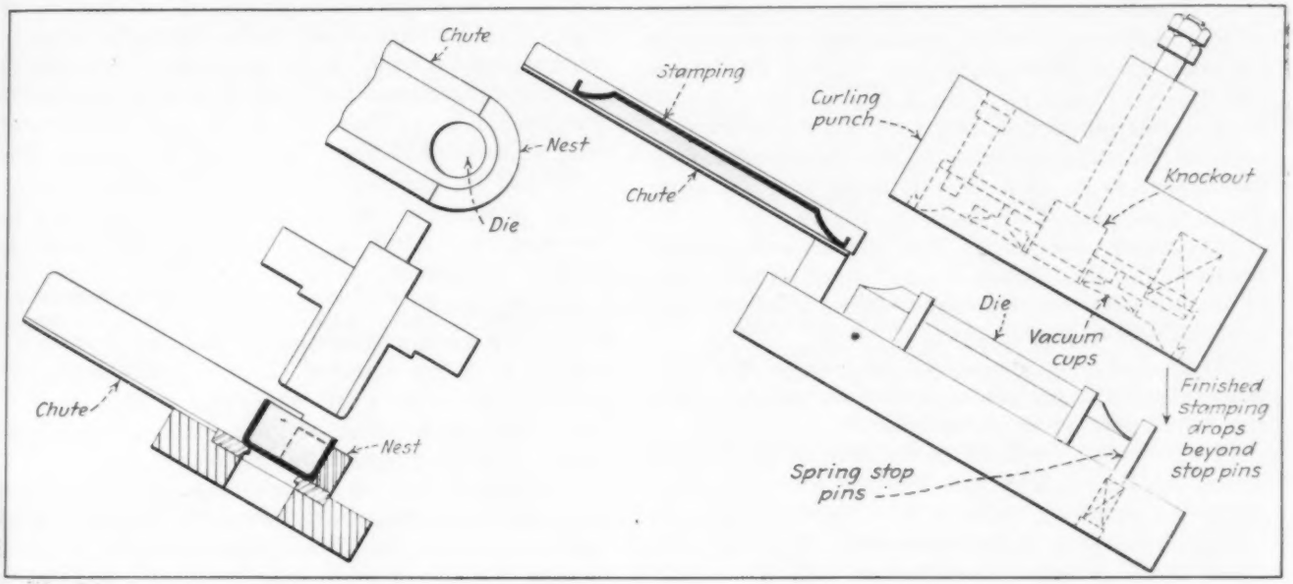
SUMMARY		
	Manufacturing cost, labor and burden	$3.00
	Machine setup cost per 1000 pcs	0.50
	Material per 1000 pcs	3.10
	Total	$6.60



Stick feeding is fast—up to 1000 pcs, per hr.—and suitable for low-quantity runs. Only shallow cups can be pushed from the chute to the center block of the die

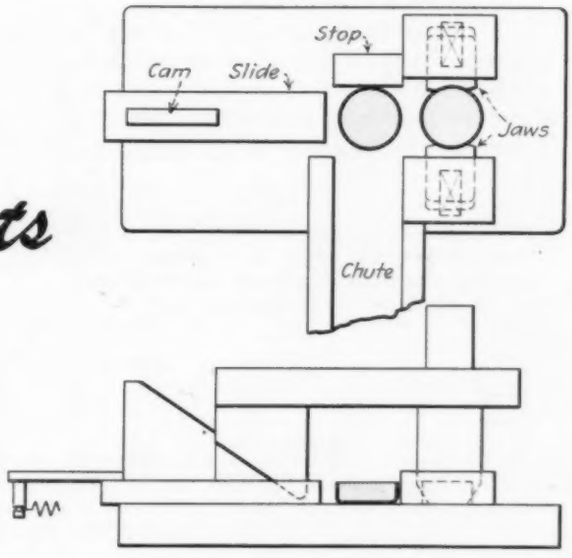


Slide feeding is best for deep stampings. Deep cups are mounted on a post and pushed under the punch. Production rate, 900 pcs. per hr.



Gravity feeds are faster than stick feeds, but require somewhat more tool work to make a nest or stop. Left—When press is stopped at each stroke, production reaches 1800 pcs. per hr.; with an escapement added and continuously running press, output reaches 2500 pcs. per hr. Right—Chute feeding of long thin-metal stamping gives output of 2000 pcs. per hr.

Feeding Arrangements



Positive lateral feed by a cam slide operates in timed relation to the press, minimizes the danger of miscuts, is therefore better than gravity feed. With a chute serving the cam slide, production of 4000 stampings per hr. may be expected with hand feeding. But 6000 per hr. is a good rate if stamping is blown through a chute from a blanking operation or is hopper fed

ence in the kind of machine selected and the amount of tool-design effort. But it is unwise to crowd too many tools or operations on a single machine in order to save machine cost; likewise, one can go too far the other way in whittling costs by choosing machines with exceptionally low burden rates at the expense of output.

For Number of Operators:

If more operators are used than necessary it takes a lot of tool designing to make up for the difference in cost. Therefore, the tool engineer should look into the possibilities of cutting down the number of operators.

1. *Operators can be eliminated by:*

(a) Transferring work from one press to another with conveyors and chutes, instead of running it into storage boxes with refeeding in another operation. This practice reduces storage space and the cost of indirect labor for handling between operations.

(b) Running more than one machine on the same operation with one operator. The machines must be automatic and feeding devices are necessary.

(c) Combining two or more successive operations in one machine. Transfer mechanisms are required for transferring stampings from station to station and the cost of the die is usually greater.

(d) Line production, whereby all machines operate at the same speed or at multiple speeds with two machines on slow operations to keep up with faster operations. Conveyors are needed.

(e) Group production. Star performers operate separately at high speed. Extra operators take care of surplus between operations. Other machines operate in partial line production.

(f) In assembly operations, by making one part automatically in a machine while an operator feeds the other part to be assembled.

(g) In packing operations, by making the part in an automatic machine and ejecting to a conveyor, while the operator packs with a packing fork and tends the machine at the same time. This is a variation of the principle described in (f).

For Speed of Production:

1. *Build up the speed of the stamping plant as a whole.* Inclined presses with compressed-air supply to blow out pieces are preferred in light-metal stamping plants. Presses with variable-speed motor drives can be adjusted to an output rate suited to the operation, line production or hookup with other presses. Supply safety stops and means for starting and stopping the presses where press hookups without operators are used.

2. *Watch service and safety.* Tools should be designed for greasing, easy sharpening and replacement of broken springs or defective parts. See that die setters are within call.

3. *Study operator convenience.* It should not be necessary for operators to go behind presses to stock or remove finished pieces. Stock handlers should pack work in boxes and remove finished work. Instruct time-study men to seek production improvements, such as pointing out trimming punch holders with overhanging parts that slow up feeding. Stock inspectors should inspect material for variations in thickness and width, nicks caused by handling and piling stock convenient to operators.

4. *Study the product design.* Sometimes a product is designed so that it must be assembled with matching parts fitted together. Time for "spotting" at assembly will be saved if one part can be turned end for end. Again, it may be seen that the product can be redesigned for straight-line production, so that it will go through all of the dies without backtracking movements. Even the simple operation of placing a piece on a horn and pulling it backwards for removal takes time. Increased operational speed will be secured if the product can be dropped into a die and be removed automatically before another piece is dropped in. Sometimes the die can be changed, but often a product redesign leads to greater economies.

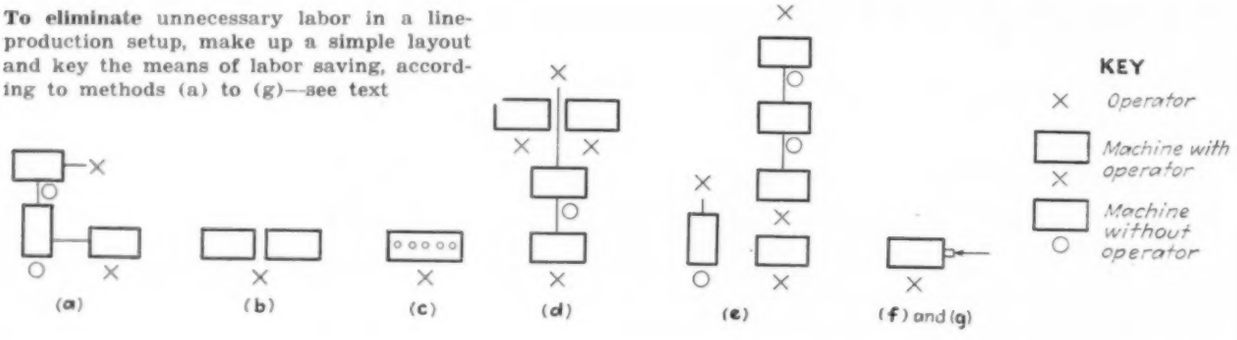
For Material:

1. *To meet competitive prices.* Investigate the basic cost of the material. The cost will depend on whether sheet stock cut into strips is cheaper than coil stock, or whether prime or second-grade material is used, quantities and packing.

2. *Check amount of material in product.* Often an assembled product uses less material than an integral structure; the labor required may be more or less. These two costs must be studied in relation to each other.

3. *Minimize scrap waste.* The amount of material wasted depends on scrap between blanks and at end of the strip. Scrap can be reduced by staggered lays or by running "pull through" in blanking dies (without web between blanks).

To eliminate unnecessary labor in a line-production setup, make up a simple layout and key the means of labor saving, according to methods (a) to (g)—see text



For Tool Cost:

1. *Compare tool costs.* The problem in tool design is to keep total cost of the product, including labor, at a minimum for the quantity wanted. When there is only one operation, the cost of two tools is compared easily:

Example: One tool costs $200, produces 600 pcs. per hr.; second tool costs $600, produces 3000 pcs. per hr.; quantity, 300,000 pcs.; labor and burden $1.50 per hr.

The formula is: $C = T_c + \frac{Q}{R} \times B$

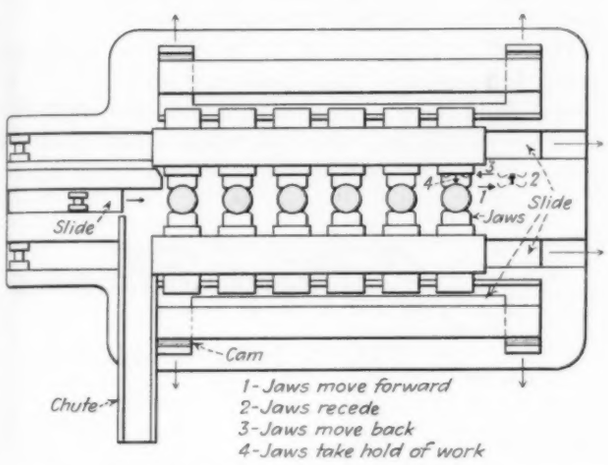
Where C = Total cost, R = Rate of production, T_c = Tool cost, B = Labor plus burden, Q = Quantity

For first tool: $C = \$200 + \frac{300{,}000}{600} \times \$1.50 = \$950$

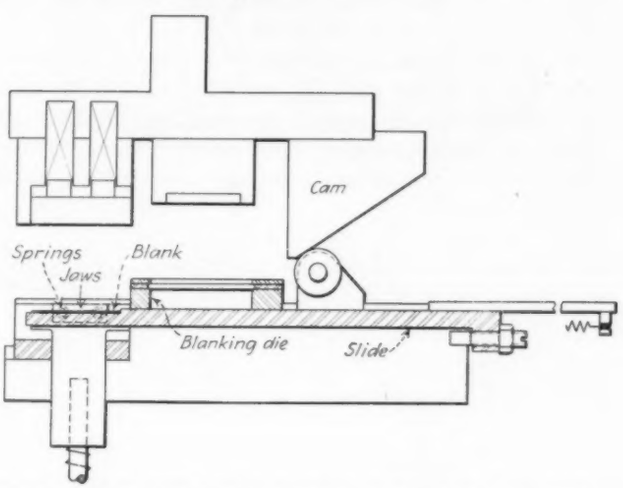
For second tool: $C = \$600 + \frac{300{,}000}{3000} \times \$1.50 = \$750$

2. *Do not rely upon arbitrary formulas.* Some formulas have been derived to show at what quantity to switch to more expensive tools. It is fre-

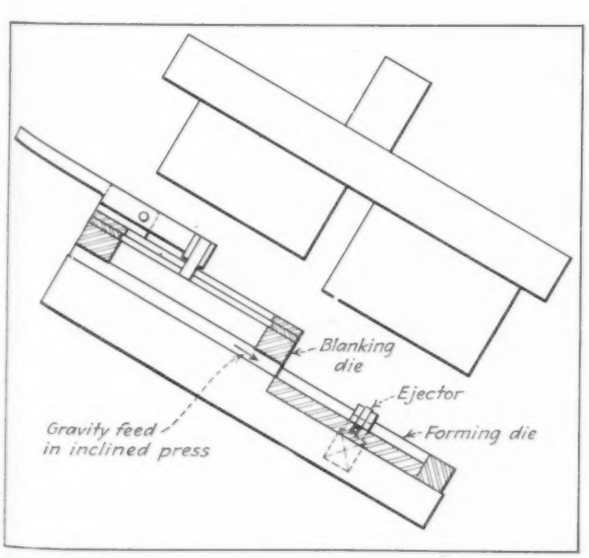
OPERATIONS COMBINED IN *Multi-Stage Dies*



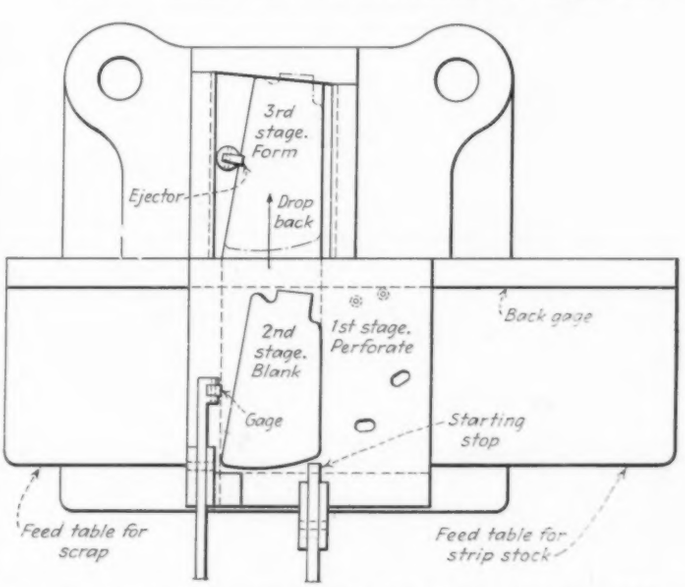
A multi-stage die performs a series of operations on one press at a production rate of approximately 4000 pcs. per hr. with hand-feeding and 5000 pcs. per hr. with automatic feeding



Push-back dies with slide feed are faster and more positive in operation than drop-back dies. The two-stage common type illustrated has a cam-operated slide which carries the first-operation blank into spring-operated retaining jaws at the second operation. Output: 5000 pcs. per hr. For more than two operations, the blank carried through successive operations by finger bars



Drop-back dies are of the gravity-feed type. Left—Work is blanked and drawn, or blanked only, at first station. Then, the piece drops by gravity to a second station for forming. Production rate, 1800 pcs. per hr. Right—In a



progressive die, the drop-back feature, together with push-back construction, makes possible perforating, blanking and forming operations on an inclined press at the rate of 2000 pcs. per hr.

quently found that die designs intended to give an increase in production speed corresponding to an increase in price are impractical.

The best way is to compare total costs directly for tools of known cost and production. Thus, line production of 600 pcs. per hr. can be compared directly with 1200 pcs. per hr. When over-all costs are calculated, nothing is left out inadvertently.

Tool-Design Suggestions

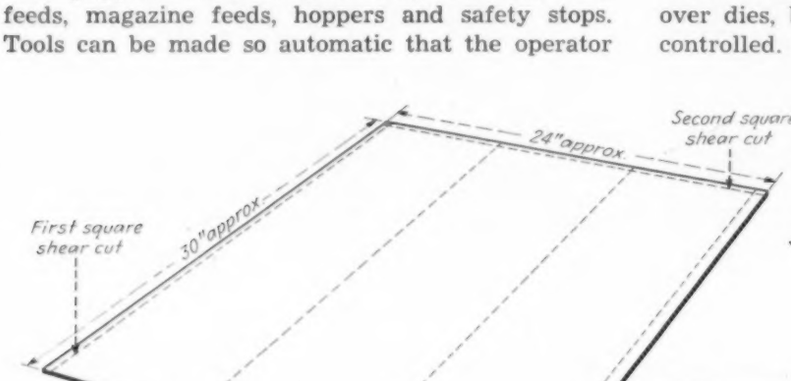
Tool designs vary according to the speed. For slow speeds and small quantities, simple hand-fed tools are best. As the quantity increases, additional expense is justified for chutes and ejectors. One of the most noticeable improvements consists of feeding devices that avoid placing the work on dies underneath punches by hand.

For semi-automatic operation, an entirely different design of die may be better. Automatic tools are equipped with feeding devices, roll feeds, strip feeds, magazine feeds, hoppers and safety stops. Tools can be made so automatic that the operator merely watches the machine. Often one operator can run a series of machines connected together for different operations up to and facilitating packing of the product. The development from simple tools to fully automatic operation progresses by steps, each of which introduces new principles of design.

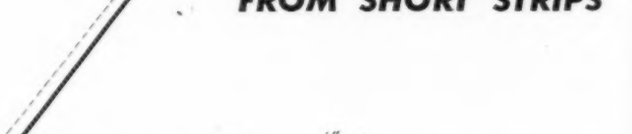
For thin metal, dies are designed differently than for heavy stock. More transfer dies are used. The stampings are blanked out and transferred for subsequent operations in the same press or next press, instead of being made in progressive dies. This practice is followed because thin-metal stampings normally require a number of operations on the periphery, after blanking, such as curling or beading to cover sharp edges. Another reason is that sheet stock cut into short strips is often cheaper than coil stock and the technique for handling short strips is different than for coil stock.

For lithographed stock, as in can making, sheet stock is necessary. Light-metal stampings can be blown from press to press and located automatically over dies, but they slip and slide unless properly controlled. Special attention must be given to trans-

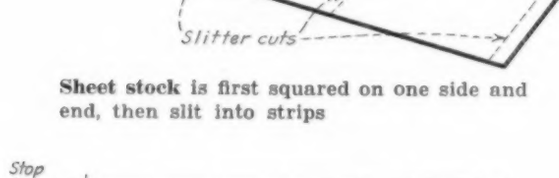
Cutting Blanks FROM SHORT STRIPS



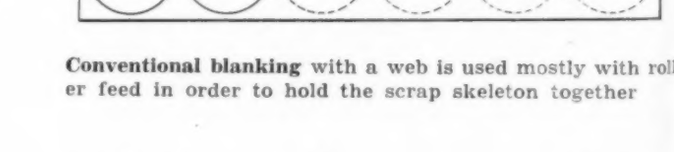
Sheet stock is first squared on one side and end, then slit into strips



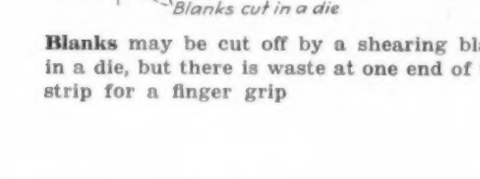
Conventional blanking with a web is used mostly with roller feed in order to hold the scrap skeleton together



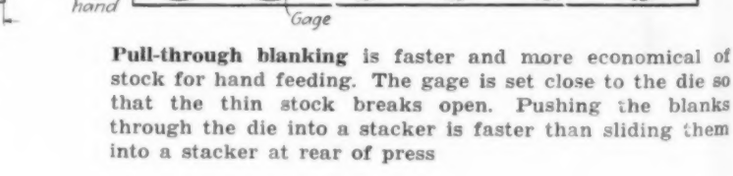
Blanks may be cut off by a shearing blade in a die, but there is waste at one end of the strip for a finger grip



Pull-through blanking is faster and more economical of stock for hand feeding. The gage is set close to the die so that the thin stock breaks open. Pushing the blanks through the die into a stacker is faster than sliding them into a stacker at rear of press

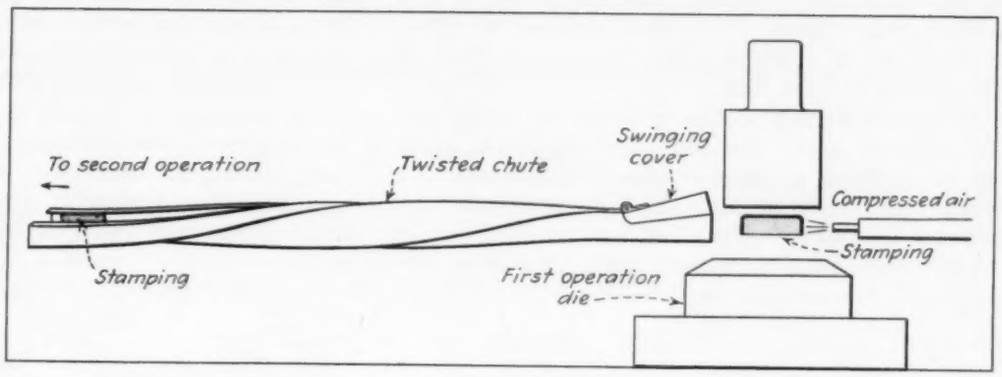


No waste for a finger grip is needed when the strip is cut into blanks on a slitter

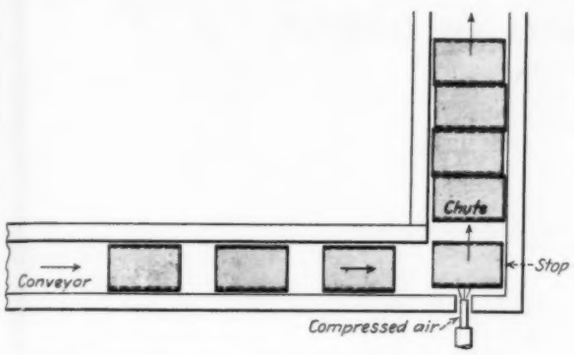


Cut-off blanking is economical for different lengths of blanks. The only waste is between blanks and at the end

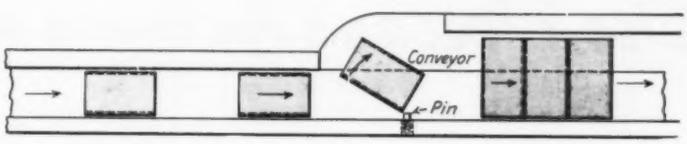
Devices to Turn Shells Upside Down



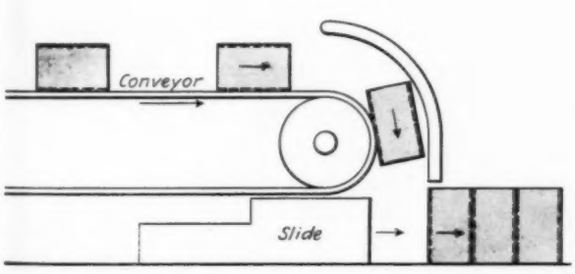
Twisted chute and compressed air transfer the first-operation shell to second-operation tool and turn the piece upside down. Feeds, chutes and ejectors to turn shells upside down are almost as important as dies



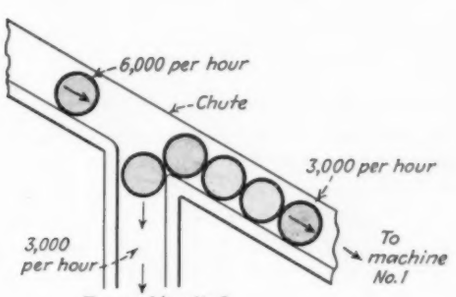
Conveyor for turning and feeding can bodies



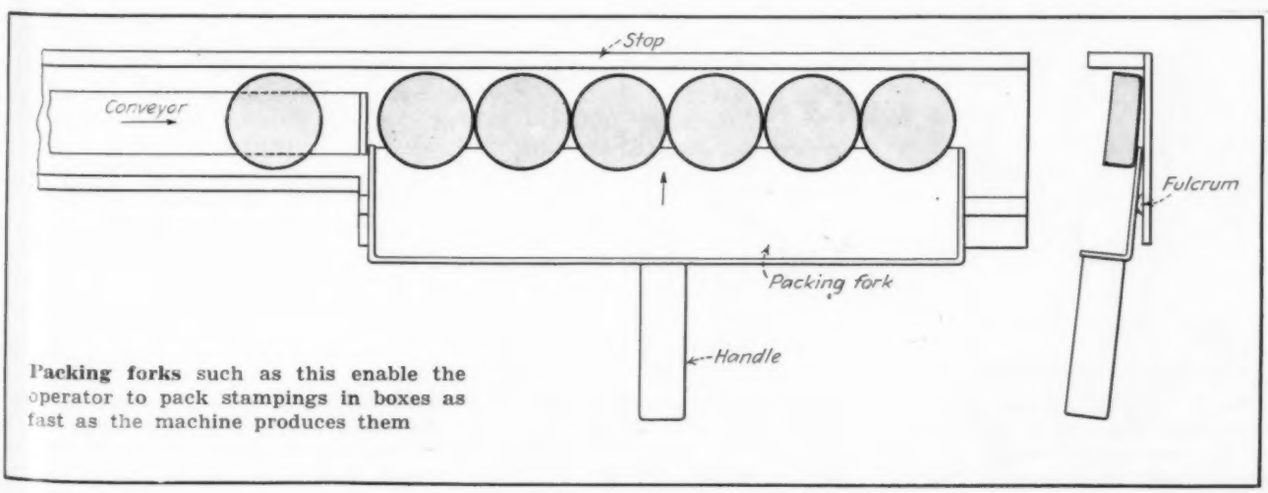
Conveyor for turning can body to vertical position



Another conveyor for turning can bodies



An overflow device incorporated in conveyors between operations is useful when the second-operation machine produces at a slower rate



Packing forks such as this enable the operator to pack stampings in boxes as fast as the machine produces them

fer devices. So that they work without attention.

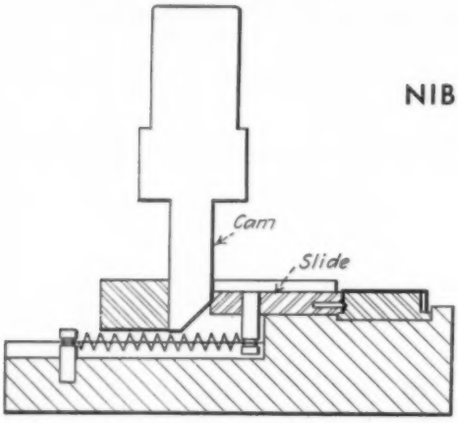
There are other considerations. Thin metal bends easily. It can be formed over arbors supported on springs and over die parts not rigid enough for bending heavy metal. Thin metal tears and wrinkles easily. It must be drawn while confined in dies and not formed in open dies.

When considering details of design for particular dies for thin metal, the steps for increasing speed can be analyzed in general. For example, suppose drawn cups are to be fed to dies for secondary operations, as redrawing, curling, etc.

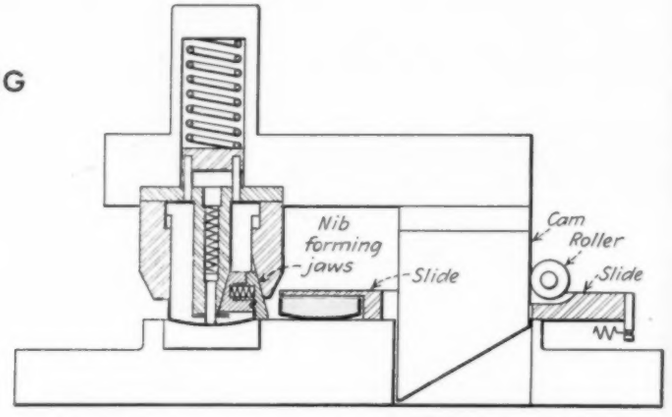
For very small quantities, temporary dies are often used to save cost. In these, loose die parts are placed in the press with the stock between. The method is used for making samples, but it is not really a production proposition. Next, come production tools in which the operator places the work by hand on fixed parts within the die. The press is provided with safety devices to prevent tripping of the press while the operator's hands are in the die. Faster methods of feeding are illustrated, followed by samples of combined operations in multiple-stage dies, cutting-off operations, better die designs for specific jobs and transfer and ejection devices. The illustrations and captions for these subjects will serve as guides toward increasing output of thin-metal stampings and reducing costs at the same time.

Die Designs FOR VARIOUS RATES OF OUTPUT

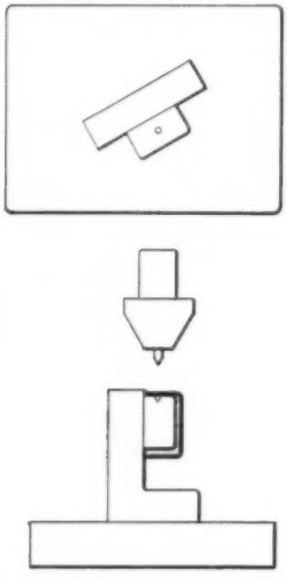
NIB FORMING DIES



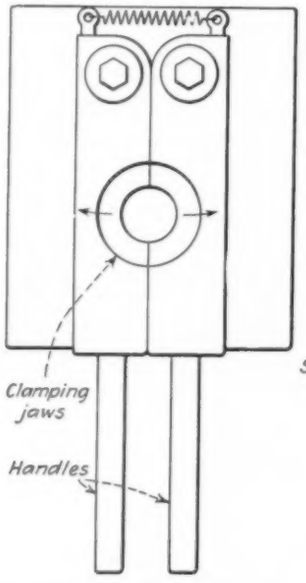
Output of 1000 pcs. per hr. and greater safety to the operator are secured from a die with cam-operated slide



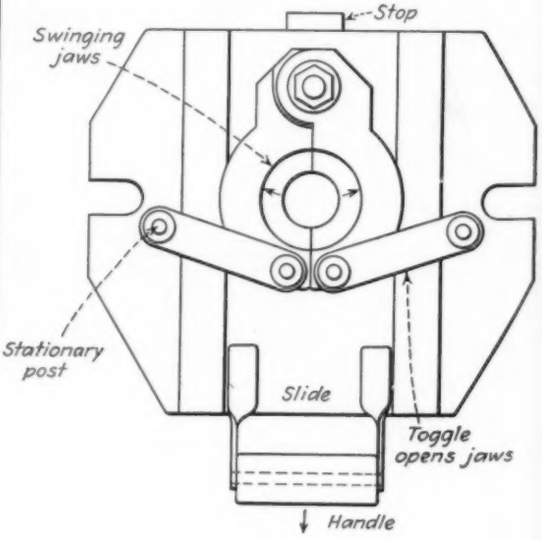
Chute feed of cups, open end up, to this lateral-feed tool permits operations as fast as stampings can be loaded. Output, 4000 pcs. per hr. with hand feeding



To form a nib in sidewall of a drawn shell, at output of 600 pcs. per hr., the cup is placed by hand on horn of a low-cost die



Hand-operated swinging jaws comprise a low-cost tool for bumping the ends of a spool. Output, 600 pcs. per hr.



By obtaining jaw movement with a slide, the operator has one hand free to load and unload. Consequently, production is raised to 1000 pcs. per hr.

TALKING SHOP

What Are Your Costs?

ONE LARGE MACHINE-TOOL BUILDER, facing red figures, has made a cost analysis which should be made by others. He finds that his cost (average for all machine products) is $9.78 per hour of finished work. This is obtained by dividing sales price by total *direct labor* hours.

He defines direct labor as the total of all wages and production bonus paid all employees for time spent producing salable goods. (Vacation, holiday and overtime *premium* are *not* included). He considers indirect labor as the total of all wages, salary and bonus paid all employees who do not produce salable goods, except administrative and sales personnel.

Labor costs per sales dollar, on this basis, are 19.2 cents for direct and 30.7 cents for indirect. Material costs are 27.2 cents for direct, 12.3 cents for indirect (lubricants, maintenance supplies, etc.). Gross manufacturing cost thus is 89.4 cents, leaving only 10.6 cents to cover selling, administration, taxes, dividends, reserves, profits and other expenses.

What are your costs? A little analysis now may avoid more serious trouble later. Send us your results — a compendium without identification can help all concerned.

Jeep Mower

ACTUATING SHAFT of chrome alloy and pitman arm of case-hardened bronze aluminum are the only two moving parts of a new front mower for jeeps. It carries a lifetime guarantee. Blades are 4, 6 or 10 ft. long and can be turned 90° for hedge trimming. It will cut "blue grass in the rain" at 3 to 5 mph., light grass at 8 mph.; can be equipped with a special arm to cut brush up to 2 in. dia. There is no report yet that the device produces milk.

Automatic Induction

BUICK ENGINEERS are applying ratchet indexing to some automatic induction hardening machines. Combinations of Microswitches and air cylinders control raising and lowering of work between indexings, turning heating current off and on, and regulating water valves.

Water consumption is a serious problem on these units. Plans are now underway to reuse the water in some way . . . Lubrication difficulties, as a result of alternate heating and cooling, were solved with Dow-Corning silicone grease.

Big Cast Shafts

CRANKSHAFTS for large diesels are now being cast at the Renton (Calif.) plant of Pacific Car & Foundry Co. This cuts tremendously the amount of machinery required on a forged shaft. Present castings range from 800 to 4,000 lb., and 6 to 18 ft. Base material is nickel-moly iron, with adequate tensile strength developed by "ladle inoculation." Shafts are stress-relieved and X-rayed before finishing. Dr. Alex Finlayson, who took over the job from Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., when that foundry's capacity was exceeded, says the cast shafts have longer life, are more easily lubricated, and have better damping properties.

Transfer or Shuttle?

AT THE DETROIT ASTE meeting, there was considerable discussion over the terms "shuttle" and "transfer" applied to new multiple machine tools. Consensus finally was that most are "shuttle" units because they move parts only; "transfer" units must move the fixture or jig as well. In other words, the shuttle machines simply pass the work along, the transfer machines work like a conveyor line. Shuttles are claimed more flexible, because unit machines can be combined or operated separately.

In one case, the original shuttle unit had two elements for roughing, three for finishing. Better tools made the second roughing unit unecessary. Originally, elements could not be installed in line; later, they were so installed, with a single control. Such changes could hardly be made with a transfer setup.

Aircraft Turbines

TOUGHEST CURRENT PROBLEM on aircraft gas turbines now is winterization, according to R. E. Small, Aircraft Gas Turbine Div., G.E. Such units must start and run at temperatures from —65 F. to +160 F. The latest unit, TG 180, delivers a jet thrust of 4000 lb., equal to 4000 hp. at 375 mph. Augmenting with water and alcohol raises this to 5000-lb. thrust for takeoff.

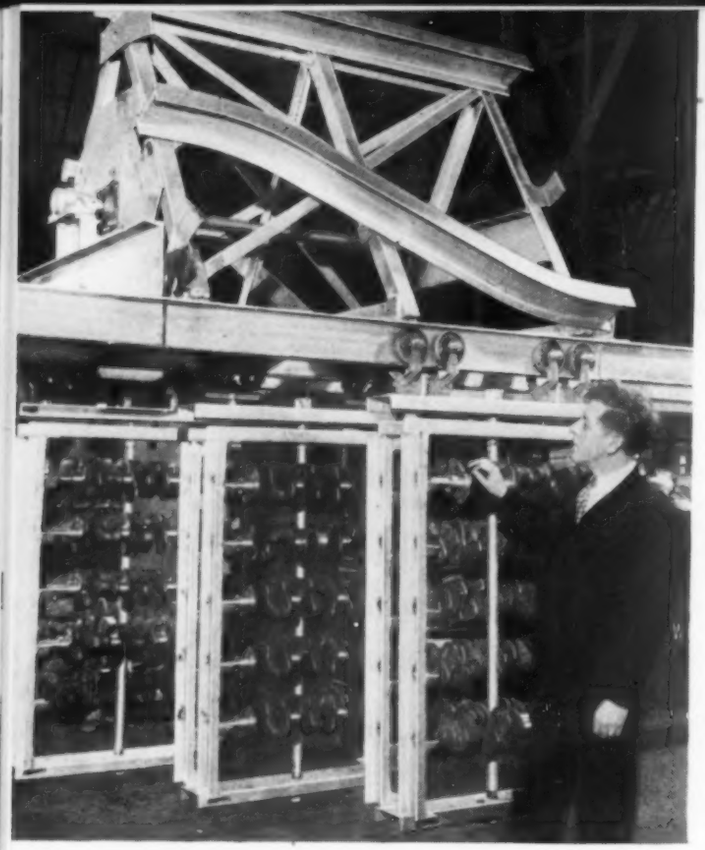
Blade development is tending away from Vitallium (non-ferrous alloy with high percentage of cobalt) toward non-strategic materials.

Turbine-driven propeller installations are coming along. In the jet unit, compression ratio is about 4:1 and only enough power is provided by the turbine to handle the air compressor. In the propeller unit, compression ratio is much higher, and all power over that for the compressor is transmitted to the propeller through a 12:1 gearbox. Turbine speed hits 13,000 rpm.

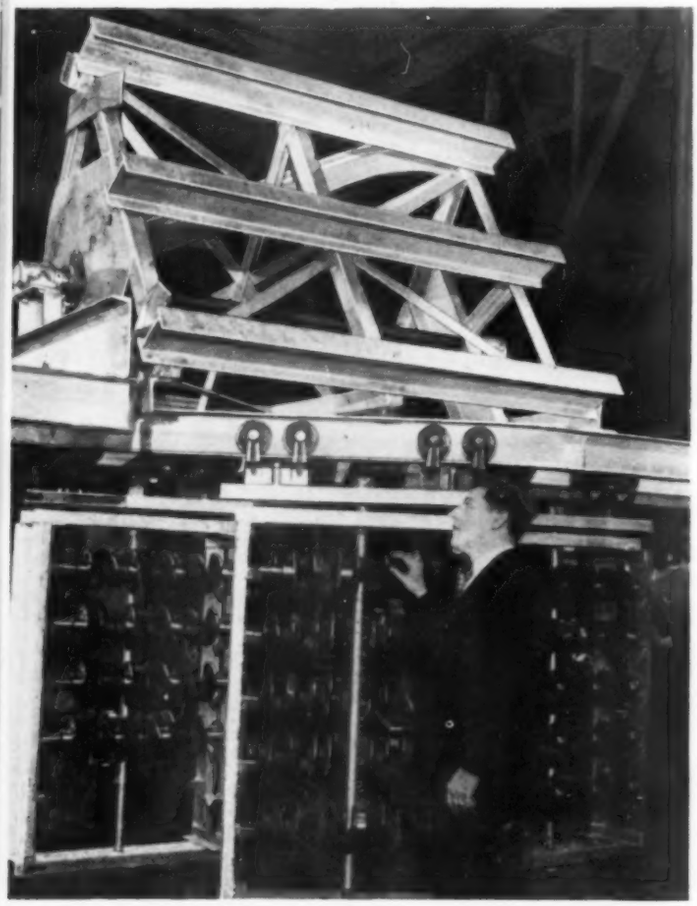
Axial compressors are now preferred. The TG 180 has an 11-stage compressor. Some units have 1600 blades, either cast-alloy or precision-forged. Forgings, profiled and polished, are working best, but costs are high, making turbines cost up to $25,000 apiece.

BARREL SWITCH

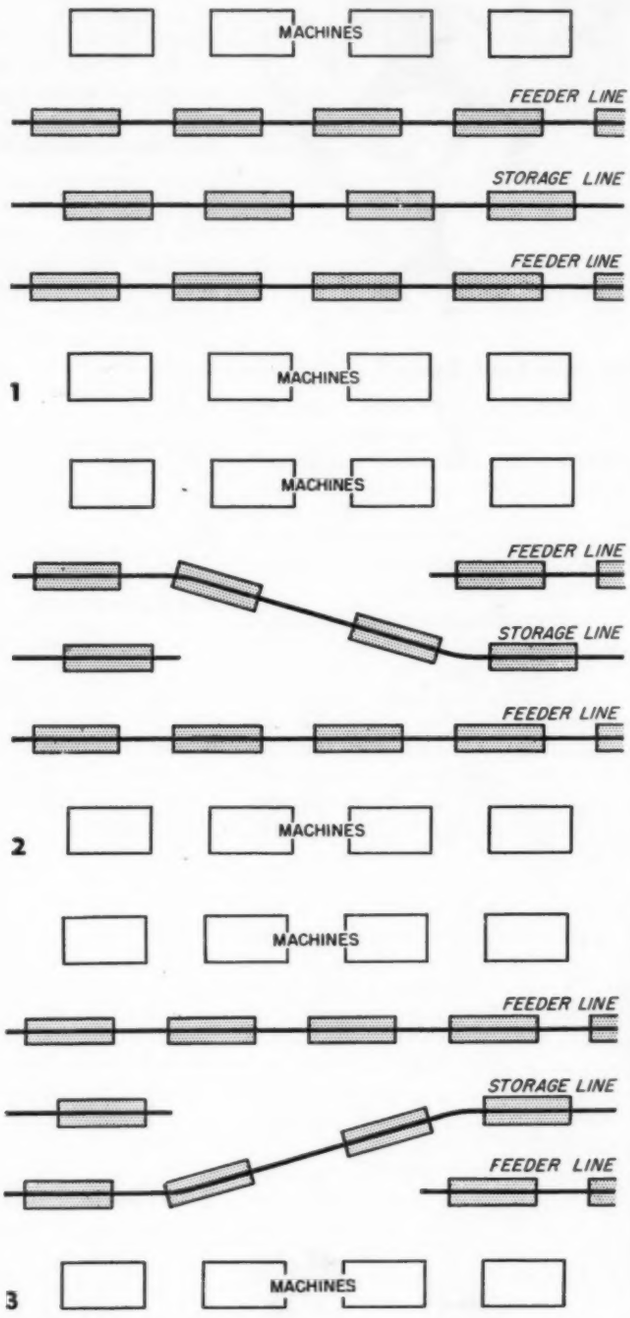
Transferring racks of ten crankshafts from feeder conveyors to temporary storage conveyors is simplified by unique switch at Kaiser-Frazer



Straight-ahead position of the switch has three straight rails to permit uninterrupted travel on all three conveyor lines



Switching from one track to another is done by rotating the switch so a curved section connects the inner with one of the outer tracks



Backlogging of work in process is avoided by the use of a storage conveyor arranged between the two main conveyors, as shown at (1). At (2) and (3) are shown the method of switching the work between the storage conveyor and either main line

SOLVES CONVEYOR PROBLEM

BY F. W. SCOONEAS
Plant Engineer, Detroit Engine Div.
KAISER-FRAZER CORP.

FEATURE in the new plant layout at Kaiser-Frazer Corp. Detroit Engine Division, is the design of an unusual set of switches on an 800-ft. monorail conveyor.

The conveyor system was set up to route crankshafts along a double line of machines on which they are processed from rough forging to final polishing. Formerly, the shafts were moved from machine to machine on space-hogging, wheeled racks, a method wholly inadequate to handle the present projected daily production of 1500 parts.

To supplant this unwieldy practice, K-F engineers designed a handling system calling for 4300 linear feet of bottom-running monorails equipped with 150 racks. Each rack holds 10 crankshafts, thus providing the system with capacity for a full day's complement.

Crankshafts are processed on parallel machine lines and are supplied to two monorails, each serving one machine line. However, this fundamentally simple delivery arrangement is complicated by the differing time elements involved at various machining stations, and the consequent need for bypassing and temporary storage of stock in process. Space limitations inherent in the size of the factory do not permit banking of stock behind the machines.

With this problem in mind, a third, center monorail was added for out-of-the-way storage. This system requires frequent exchange of racks between the outer feeder monorails and the center storage rail. Hence, the design and installation of a set of routing switches became essential. A slide switch, often used for such purposes, was ruled out for two reasons. First, there was not enough room, and second, a slide switch of heavy design, probably requiring power operation, would have been required to carry the 1300-lb. rack across the gap between the tracks.

The simple, K-F-designed, barrel switch solved the problem effectively. Operated manually, the revolving fixture has two curved rails and one set of three straight rails, and can be rotated on roller bearings to any one of the three routing stages. Automatic controls lock the fixture in position when the switching rails are lined up with the conveyor rails.

When the crankshafts are to be routed in a straight line, the fixture is revolved until the straight rails are in position. When the racks are to be routed from either of the feeder lines to the storage line, or vice versa, it is similarly revolved until one of the curved rails indexes into the required position.

Under this system, there is no limit to the number of racks that can be transferred from one monorail to another at a time, inasmuch as the switch does not have to bear the weight of all the racks to be transferred.

Gear Measurement Over Non-Standard Pins—Discussion

Three readers take exception to the method recently described by a contributor and show other methods of calculation

(1)

BY LOUIS D. MARTIN
Chairman, Fine-Pitch Gearing Committee
American Gear Manufacturers Association

The Reference Book Sheet under the above title (*A.M.* p. 301, Jan. 29, 1948) is in error, in that E. J. Rantsch ignores the fact that gear teeth have curvature. His method would be all right for straight-sided rack teeth, but is not at all within acceptance limits for involute gear teeth. In his example, the calculations yield a reading 0.0087 in. greater than is correct.

Reference should be made to "Involute Gear Calculations Simplified" by Allan H. Candee (*A.M.*, p. 122, Sept. 13, 1945). In that article, Mr. Candee considers at length the correct procedure for calculating measurement of gears over pins with any size pin.

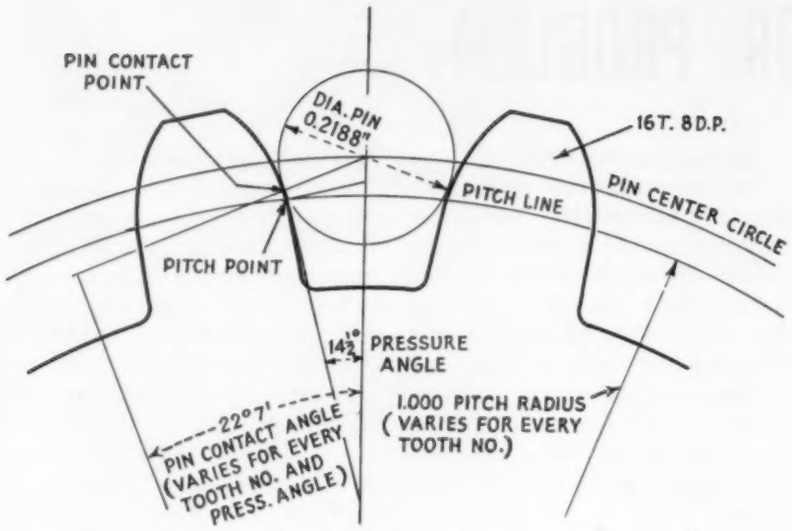
(2)

BY RALPH A. MINER

The method published is incorrect and would, if used for small gears, cause serious difficulty in production and inspection.

The correct measurement for checking a 16-tooth, 8 D.P., 14½° gear over 0.225-dia. pins is 2.3311 in., not 2.3398 in., as stated. An error of 0.0087 is excessive, and gears could not be assembled unless cut with considerable backlash allowance.

The discrepancy is due to error in angles shown in Figs. 2 & 3. A contact angle of 14½° is correct for a rack only, and approximately correct for a large number of teeth. For the 16-tooth gear given, the angle in Fig. 2 should be approximately 22° 6′, and the angle in Fig.


PIN CONTACT POINT
DIA. PIN 0.2188"
16 T. 8 D.P.
PITCH LINE
PIN CENTER CIRCLE
PITCH POINT
14½° PRESSURE ANGLE
1.000 PITCH RADIUS (VARIES FOR EVERY TOOTH NO.)
22° 7' PIN CONTACT ANGLE (VARIES FOR EVERY TOOTH NO. AND PRESS. ANGLE)

According to R. Parkes, the pin contact angle varies for every tooth number and pressure angle

3 should be approximately 23° 10′. The correct angles vary with the number of teeth and diameter of pins and are, for most gears, far from 14½°. Calculations for angle in Fig. 2, 16 teeth:

$$\frac{16 \times \cos 14\frac{1}{2}^\circ}{18.469 - 1.750} = 0.92651 = \cos 22^\circ 6'$$

For 10 teeth:

$$\frac{10 \times \cos 14\frac{1}{2}^\circ}{12.415 - 1.750} = 0.90778 = \cos 24^\circ 48'.$$

24° 48′ — 14° 30′ = 10° 18′ error in Fig. 2. Error in Fig. 3 is slightly larger.

Conclusion: Closer inspection will be obtained with 7/32-in. drill-rod and dimensions obtained from standard table shown than with 0.225-in. pins lapped to gage-block accuracy and used with inaccurate calculations. Or, check 16-tooth example shown by chordal measurement over two adjacent teeth with gage or vernier caliper. Dimension is 0.5810 in. less the backlash required.

(3)

BY R. PARKES

Assistant Chief Engineer,
Western Machine Tool Works

The author has made the common error of assuming that the corrections involved for non-standard pins is a function of the normal pressure angle of 14½° or 20°.

The pins only contact the tooth profiles at an angle equal to the normal pressure angle, when applied to a gear of infinite radius; that is, a straight-sided rack. The contact angle also varies for every tooth number and is entirely different than a normal pressure angle used in the published calculations. This is illustrated on the sketch.

To show the discrepancies, the example used by the author will be recalculated:

Number of teeth — 16
Diametral pitch — 8
Pressure angle — 14½°
Pitch diameter — 2.000 in.

The theoretical contact angle of the pin may be obtained from the following formula:

$$\cos a' = \frac{D \cos a}{D'}$$

where a = pressure angle = 14½°

a' = contact angle
D = pitch diameter = 2.000
D' = diameter of pin circle centers;

i.e. 2.3086 — 0.2188 = 2.0898

Therefore:

$$\cos a' = \frac{2 \times \cos 14\frac{1}{2}^\circ}{2.0898} = 0.9265$$

$$a' = 22^\circ 7'$$

Let d equal difference in pin diameters from standard; that is, 0.0062 in.

X = difference in measurement over pins

a' = contact angle of pins; 22° 7′.

Therefore:

$X = d$ (cosec a′ + 1)
= 0.0062 (2.656 + 1)
= 0.0227 in. for 16-tooth gear

Therefore, M′ (over 0.225 pins) = 2.3086 + 0.0227, = 2.3313 in.

And X for rack, or very large gear, = 0.0062 (cosec 14½° + 1)
= 0.0062 × (4 + 1)
= 0.031 in.

Thus, in the case cited there is an error of 0.0085 in. (2.3398 — 2.3313). Similar errors of even greater magnitude will be apparent where the pins vary from standard more than that illustrated.

It follows, therefore, that the corrections applied to the M dimension over pins is not a function of the nominal pressure angle, as the author has used it, but depends primarily on the theoretical contact angle, which changes with every tooth number.

WHEN A SLOWER CUT IS FASTER

Floor-to-floor time is not always decreased by operating the machine at higher speed. This was pointed out by Myron S. Curtis, assistant director of engineering, Warner & Swasey at the recent Westinghouse Machine Tool Forum.

An example cited was a customer who had a die-cast gear which he wished to machine at 1500 rpm., and to tap at 500 rpm. The extra time required to accelerate and decelerate the spindle for 1500 rpm. made slower speeds more economical. By machining at 1000 rpm. and tapping at 50 rpm. a saving of 10% in floor-to-floor time was achieved.

This does not mean that important savings cannot often be obtained by faster machining, but there has been a tendency to speculate on a new era of fantastic machining practices. Somewhere along the line there is a limit to the practical speed. After that it is much more important to pay attention to cutting handling time.

ROUND TABLE

Should Suggestions Be Screened?

"Say, Al," greeted Ed, "It seems a puzzle to me that so many good ideas are suddenly reaching suggestion headquarters."

"Well, Ed, this is no small plant, you know," smiled Al. "Fifteen hundred men. . . ."

"The plant, my eye!" interrupted Ed. "I'm speaking about ideas going in from my own department."

"Well, that's fine, Old Boy," said Al, "That ought to make you proud."

"Oh yeah?" scowled Ed. "I can't see where I'll reap any glory from it—in fact I sort of feel funny about ideas going through unless I pass on 'em first—sorta seems like going over my head, somehow or other."

"That's where you're wrong, Ed," assured Al. "The idea of the secret box is to make certain that no prejudice will interfere with the decision on the suggestion."

"Oh, I don't know about that," replied Ed. "I can't see why the boys can't confide in me—gosh, Al, I'm not going to steal their thunder; am I?"

"That's one of the purposes of the suggestion box. You see, Ed, it's entirely a secret proposition until a decision is made."

"Well, if it's such a secret, how is it that the news gets around to me?" pressed Ed. "Hamilton told me that my department was certainly putting a lot of new ideas through as suggestions."

"That's only natural that some word would be passed on to you, Ed. I'll bet you that there was no mention of what the ideas were about. Remember, Old Timer, your're just the foreman; you have no right to conclude that you can control the mental processes of your men."

"It would give me an idea of who the progressive fellows were if I could know what's going on. I could help with the ideas, too—make some of 'em surer of being accepted."

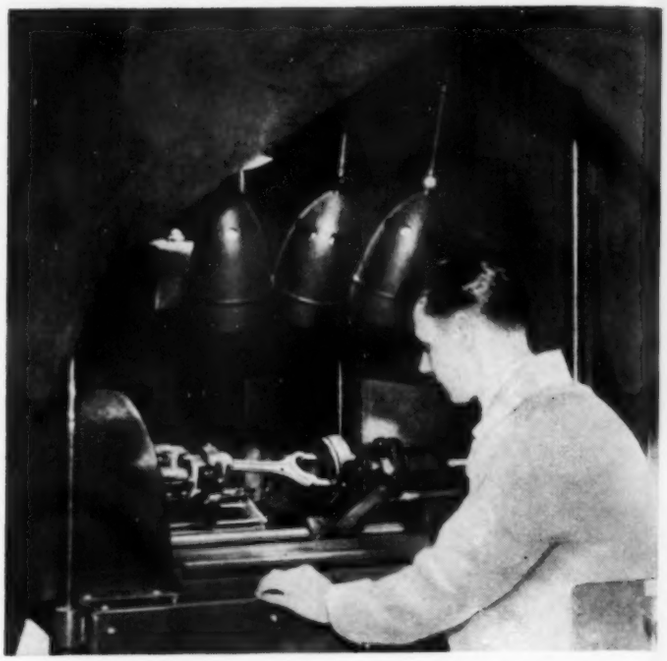
"No, look, Ed, if one of the men, for instance, were to speak to you about an idea he had, there is no guarantee that he wouldn't be influenced one way or another—you know that you may be wrong in your opinion as to the merits of the idea and throw cold water over the man's enthusiasm."

"I still feel that the foreman should pass on an idea before it goes any further," Ed insisted. "By the foreman of the department passing on an idea, coming from that department, before it goes through clearance, it can save considerable time and prevent petty ideas from interfering with the more important ones."

"And I feel different," Al smiled. "To me, absolute non-interference with the man making the suggestion is paramount."

IS THE "SECRET" SUGGESTION BOX SENSIBLE? *Should the foreman screen ideas before submission—or is his "help" likely to be a device for hogging credit? Your ideas will help others clarify this problem. Discussions of earlier topics appear on later pages.*

Process Control Corrects Faulty Methods



Connecting-rod inspection is done on a complete fluorescent-magnetic unit. Savings are estimated to amortize the cost of equipment and installation in approximately seven months. More forged parts are being manufacturerd, scale free, without pickling, and the fluorescent method is supplanting visual inspection. The method lends itself to mechanization, and fewer errors occur

Investigation to find the best way, plus teamwork between line and staff pays dividends of improved quality and lower defective-work charges

BY CHESTER S. RICKER,
DETROIT EDITOR

From an interview with the late
R. H. McCARROLL,
FORD MOTOR COMPANY

WHAT is process control? It means different things to different people, depending on their viewpoint.

At the Ford Motor Company, process control is a staff function, and the process control section assists departmental executives in almost every manufacturing division. Purpose of the section is to improve quality by making it easier to do things the right way the first time.

Staff members try to find the best procedures both inside and outside the plant and to reduce this information to writing so it can be tested in practice. After the procedure has been tested, process control men record the exact methods and place this description in the hands of the division superintendent. It is understood that this procedure will be followed religiously until the product is changed or tools and equipment are improved.

The process control section must not be confused with the inspection department, which is interested only in dimensional control, nor with the quality control group, which does "trouble-shooting" and is interested in curative work. The main interest of the process control section is trouble-preventive work.

In its role as "helper" the section suggests improved methods and equipment and may even train supervisory men for special manufacturing conditions. The staff assists line personnel by recording their ideas for doing the job and by seeing that the specified method is followed. The section will fail if it is not supported 100% by top management.

An excellent example of what happens when top management fails to realize the economic importance of process control was told the writer during a discussion of the application of process control to the shop. One company supplying material worth hundreds of thousands of dollars was experiencing high percentages of rejection. Ford officials were concerned about this because it held back their production. The part was one that Ford was making and for which a successful process control procedure had been developed. It was a simple matter, then, for top-

Crack in a connecting-rod cap is revealed by the yellow glow of fluorescent magnetic particles under ultra-violet light. Part is previously coated with solution containing the particles, then washed; particles remain only in the cracks

echelon men of Ford to offer the procedure to men of similar status in the supplying company. The most interesting thing about the whole matter is that the offer was rejected because "the company had so many secret processes that they did not want to put them down on paper so they could be stolen." And yet that company showed a serious operating deficit for the year, probably because of so much spoilage that had to be replaced.

Of what does a process-control section consist? There are five definite functional divisions: (a) process control supervisors; (b) specialists, or functional supervisors; (c) specification writers; (d) report analysts who check trends and analyze processes; and (e) field men.

The purpose of the process-control division is to find the best way and its members interview everyone who has constructive knowledge of the matter. All data and information as to procedure and equipment is carefully checked with the responsible line supervisors. The information is then digested by process control and new ideas, if any, are introduced from the outside. The resultant procedure is reviewed by the line supervisors. This crystallizes their thinking and that of the process-control staff.

Some important functions of the process-control section working with the other departments are: (1) training supervisory personnel, (2) suggesting improvements, (3) bettering the education of machine operators, (4) eliminating unnecessary operations, (5) striving for more uniformity in quality, (6) reducing re-runs and repairs and (7) finding ways and means of lowering scrap losses.

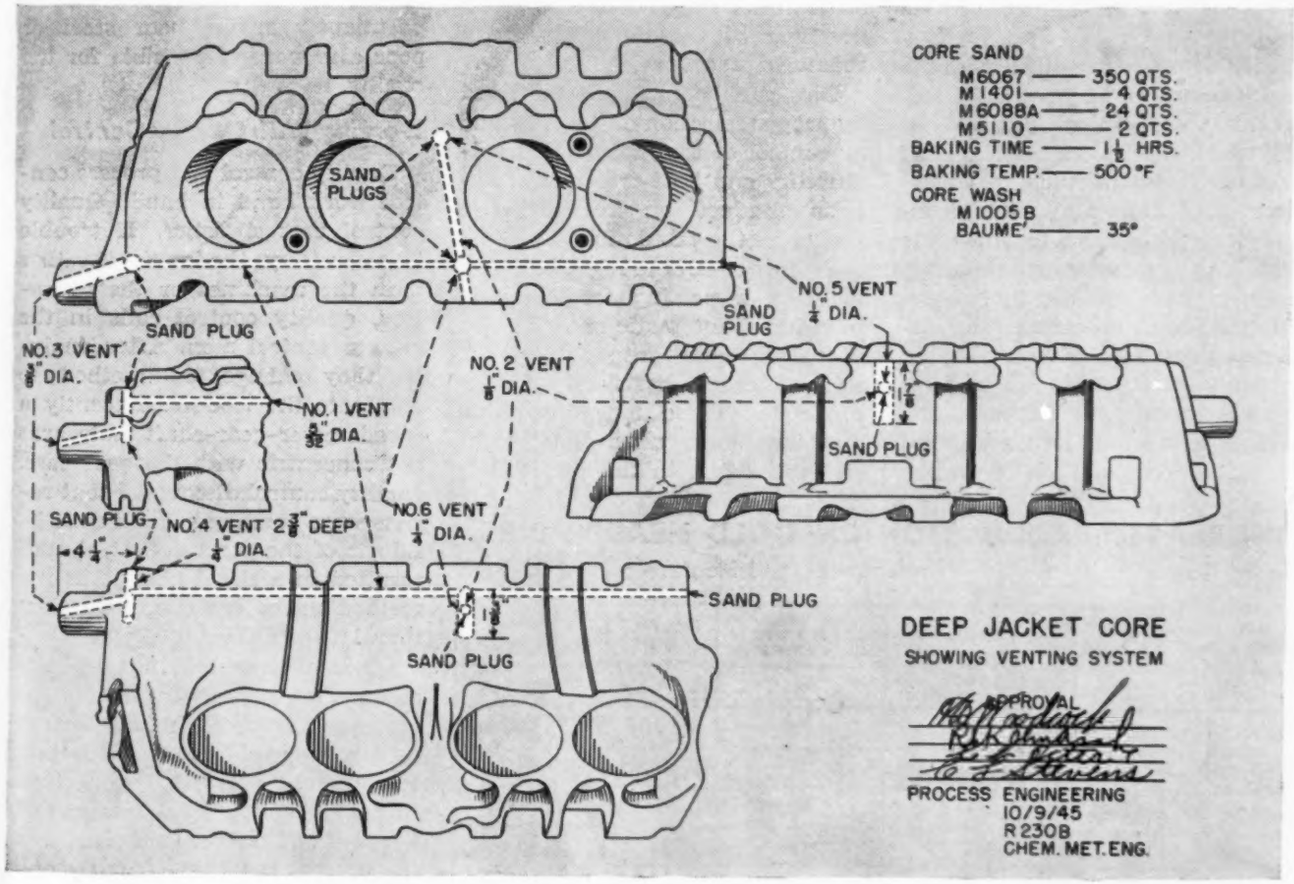
Successful Applications

Process control now is being applied to steel-making, forging, cold-heading, heat-treating, electroplating, cold-forming sheet steel and foundry operations.

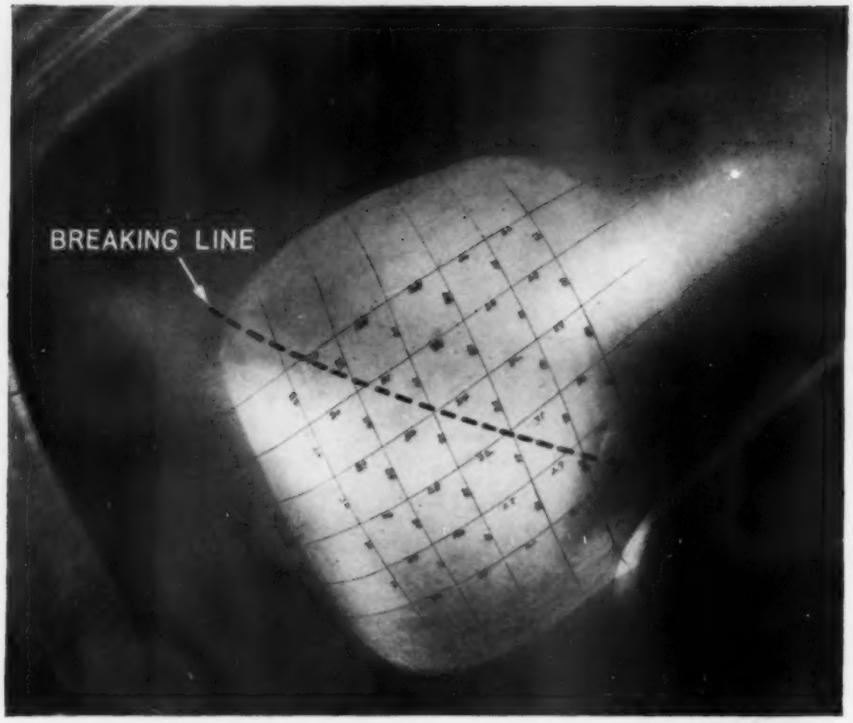
In the steel-making division it was found that it was possible to spoil many tons of perfect steel unless the ingot track time was carefully controlled.

In the foundry, many losses were caused by improper pouring temperatures. During the war it was the customary practice to put a thermocouple in the ladle of molten magnesium. Pouring was started only when a certain temperature was reached and was stopped when the temperature dropped below the critical level. Process control found the best pouring temperature and also made sure that supervisors followed the practice which they themselves had established.

Another great source of losses was the improper venting of cylinder-block cores. Process control followed this job until the satisfactory way of venting cores had been determined. Then rough sketches were made to show how to vent these cores properly. The sketch below indicates more than just the venting. In the upper right-hand corner is listed the proper mixture of core sand, the proper baking time and the proper baking tem-



Sketch guides foundry during assembly of mold for the deep jacket core of a Ford cylinder block. Location and size of all vents are shown. Proper venting aids in removing gases, thereby preventing blows



Scribed squares on the critical area of a Ford front fender enable determination of the elongation in the metal

perature for best foundry results.

In forging, several new processes have been developed by the cooperation of process control with the line supervisors in those divisions. In this case, process control not only worked with engineering, but also with manufacturing. Cross-sections of a passenger-car front spindle were etched to show the grain size, the grain structure, and the metal flow obtained by two entirely different processes. The extrusion-press method now adopted not only gives better grain flow, but also eliminates the flash and reduces to a minimum the amount of metal removed in finishing. Thus, steel, machine time, and structural strength have all been involved in the development of this new procedure.

Dies can be made longer-lived by proper selection of the steel and by control of the grain size, hardenability and heat-treatment. Results obtained on five dies are shown in the tabulation.

Process control brought in a new tool for inspecting forgings and introduced automatic machines preparing and inspecting such things as crank shafts and connecting rods. These new inspection machines have ultra-violet light and the defect in the material is indicated by a brilliant luminous line made by the fluorescence of the magnetic liquid that is placed over the material. The units dip the connecting rod in the solution and then bring it up to the inspection point. This makes possible rapid inspection by novices, eliminates defective material at the start, and saves hours of machine time otherwise lost in scrap material.

In the plating department, process control found that the condition of the anodes and the bus-bar contacts could be greatly improved by a regular maintenance procedure. Permanent magnet holders to assure better contacts for certain kinds of material were also suggested.

Cooperating with the press department personnel the process-control men improved the product and reduced the scrap loss. By means of scribed squares, they evaluated the elongation and the strain in the metal at a critical area. The front fender, above, is an example. This method enabled process control to tell the press department whether poor steel or poor dies were responsible for the results.

Working With Quality Control

Quality control and process control work hand in hand. Quality control uses statistics. If trouble is caused by the method rather than the machines or the operators, quality control calls in the process-control men. After analysis they change the method to eliminate the trouble. Recently a speedometer-gear-shaft hole was not concentric with the gear case. Quality control discovered that rejects were running as high as 12%. Efforts of the process-control staff resulted in a slight change in the method and rejects dropped to less than 1%.

Quality control brings up another point, namely inspection. In making valve pushrods, before quality control, 100% inspection required 10 inspectors per shift. Rejects ran about 4%. Analysis of the cause of rejects was made and the process recorded. Quality improved and rejects dropped to 0.5%. Now quality control can se-

INCREASED PRODUCTION ON COLD HEADER DIES

Due to Control of Grain Size, Hardenability and Heat Treatment of Tools

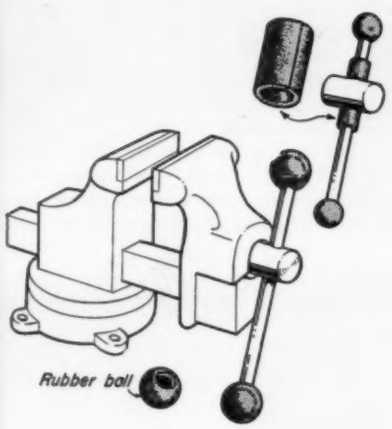
AVERAGE PRODUCTION BEFORE CHANGE	AFTER CHANGE	CHANGE MADE	EST. TOOLS SAVED PER YEAR BASED ON 1946 PROD.	TOOL COST EACH	EST. SAVING PER YEAR
40,000	60,333	STEEL & HEAT TREAT	51	$ 4.35	$ 221.85
10,000	20,430	"	125	10.19	1273.75
30,000	33,500	"	35	4.85	167.75
35,000	49,375	"	403	5.35	2156.05
2,800	4,500	"	256	30.00	7680.00
			TOTAL SAVING PER YR. ON 5 DIES		$11,499.70

lect a certain number of pieces out of each batch and turn them over to an inspector. One man is able, with this new setup, to handle all the production of one shift. The reason process-control men were brought into this picture was that operators were working from the high limit instead of from an intermediate point. Machines were satisfactory, and no change in engineering tolerances was required. Only a change in process was necessary.

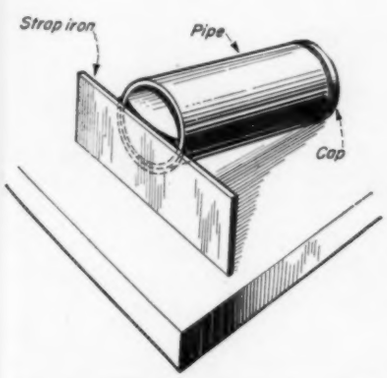
These are typical examples of what a process-control section can do in stimulating thinking and improvements. Process control is a tool of management for the introduction of better methods and new ideas into every department. Section members are helpers, not directors, of line personnel in the organization. Remember that the sole purpose of the process-control section is to improve quality by making it easier to do things the right way the first time. The higher quality, the lower losses. The smaller losses, the greater production per machine and per man. This in the end means lower costs and greater volume. That is what management wants and it is the proper function of a process-control section as Ford understands it.

Short Cuts FOR THE SMALL SHOP

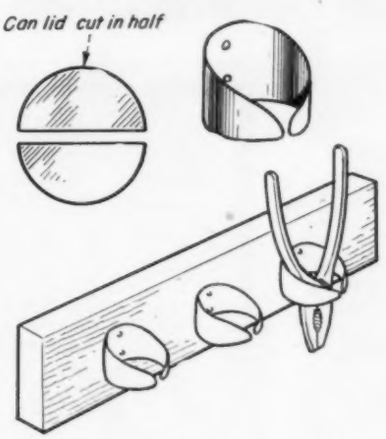
BY A. H. WAYCHOFF



TAKE YOUR choice of two methods of avoiding pinching the skin between thumb and forefinger when the ball of the vise handle falls. Either cut holes in hollow rubber balls and force them over the balls of the handle, or slip rubber rings over the handle and up against the screw.

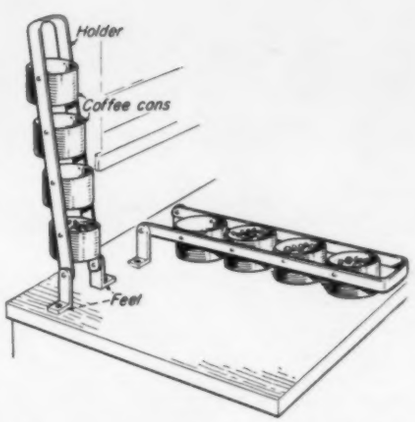


A CONVENIENT, non-tipping welding flux container can be made of pipe as follows. Screw a cap or weld a disk to one end of a piece of 3 in. pipe about 6 in. long. Next weld a piece of strap iron ⅛x3x6 in. to the other end so that it covers half the opening. When this container is laid on bench or floor, it will not tip or roll, and the rod can be dipped easily into the flux.



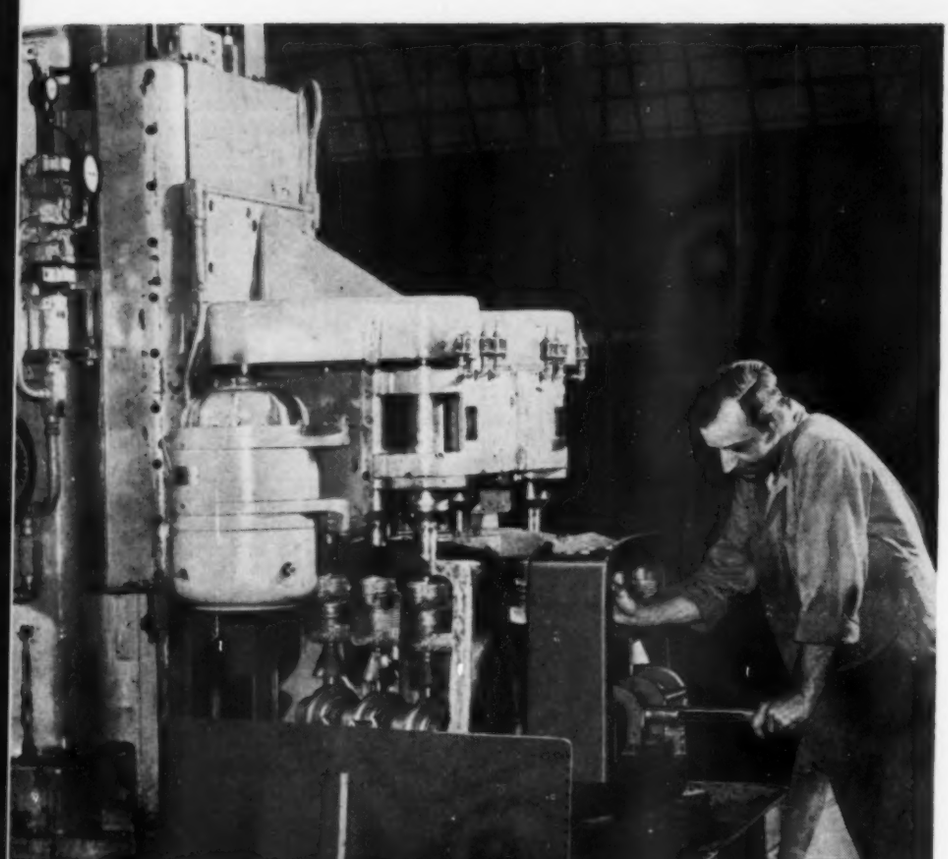
BRACKETS or holders for tools are cheaply and easily made thus: Cut disks from can lids or other sheet metal. Then cut the disks in two and curl the ends. Nail the brackets to the wall to hold screwdrivers, pliers and handle tools in general.

PARTS STORAGE can be accomplished in various ways. Here is ar idea that allows a rather large quantity of material to be stored handily at the back of the bench. From strap iron make a U-shaped support about 3 ft. high. Drill 3/16-in. bolt holes in the legs to support old coffee cans. Pin the holder to brackets at the rear of the bench, so the holder will lean back against the wall. To get



the wanted article, merely pull the holder forward so the cans sit on the bench, pick out the item, and swing back the holder so it rests against the wall.

OLD ICE TONGS make a better pair of crucible tongs. Give each jaw a quarter twist and rivet curved pieces of strap iron to them. The crucible can be transported with one hand, using these converted tongs, and much more safely.



SHOP SHOTS

AT

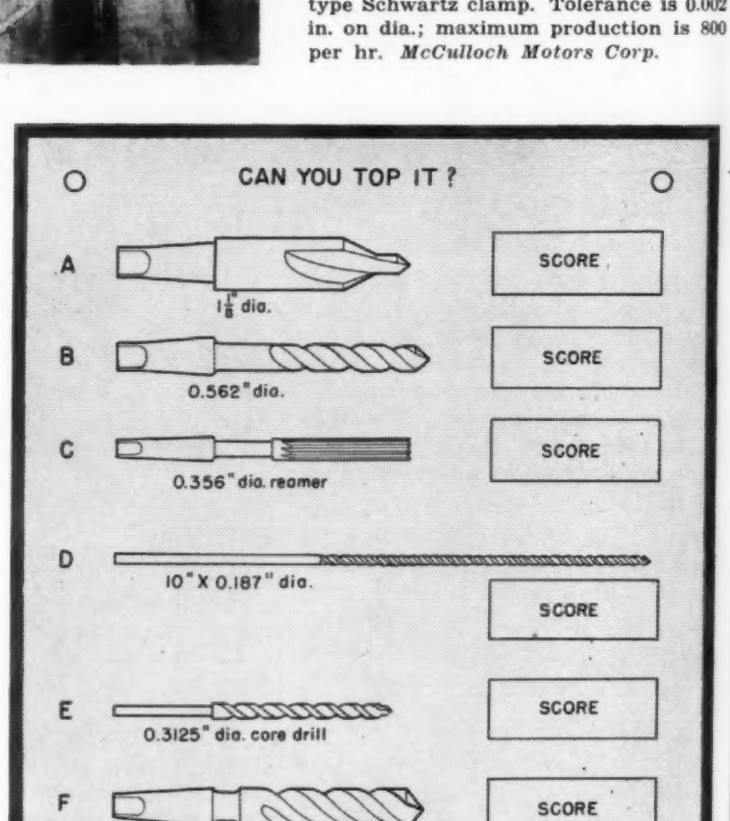
McCULLOCH MOTORS CORP.

LOGANSPORT MACHINE CO.

WESTINGHOUSE ELECTRIC CORP.

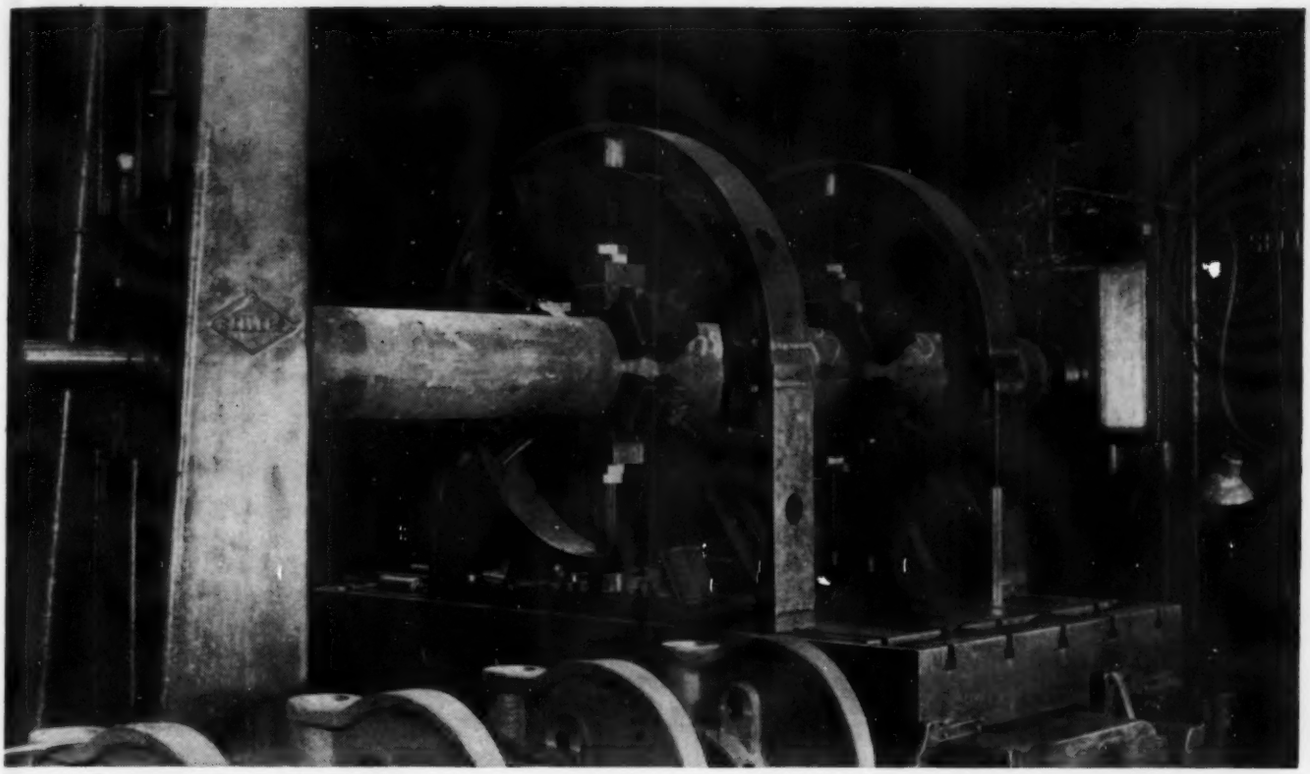
Steel cylinder sleeves, integrally cast into die-cast cylinders of two-cycle gasoline engines, are rough- and finish-bored, three at a time, on Barnes vertical boring machine. Meanwhile, three finished cylinders are removed and three new ones loaded on rotating bed and held in place by quick-acting wedge-type Schwartz clamp. Tolerance is 0.002 in. on dia.; maximum production is 800 per hr. *McCulloch Motors Corp.*

CAN YOU TOP IT? Here is what one foreman does to save his own time and to needle tool salesmen who have something to sell that is the "last word" in its class. The foreman just points to a display board which shows a sample of each replaceable tool that he requires in the automobile-crankshaft department. Beside each tool is the average performance it is giving in that department. Each card shows how many pieces can be made in 8 hr., how many holes per grind, how many grinds per drill and how many pieces per drill. These data are tabulated below →

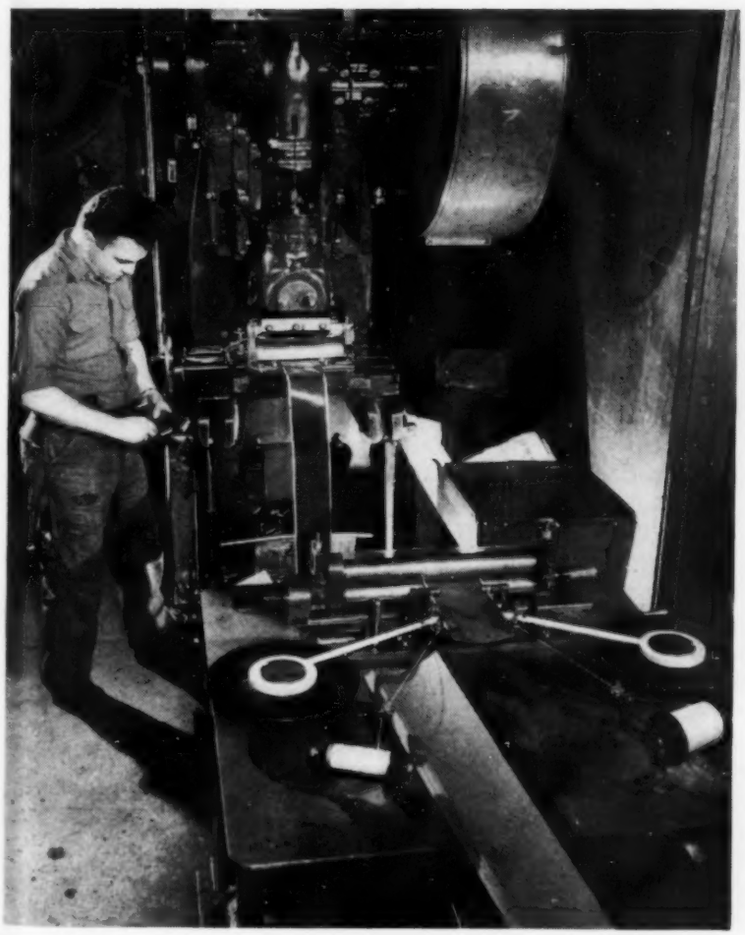


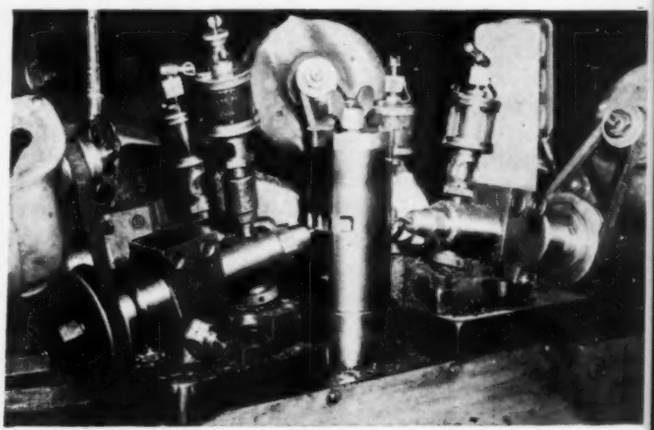
SCOREBOARD DATA

Drill	Units in 8 hr.	Holes per Grind	Grinds per Drill	Units per Drill
A	615	100	12	1200
B	386	50	32	1600
C	380	300	8	2400
D	176	10	5	50
E	600	50	12	600
F	115	14.6	20	293
G	153	24.1	20	483



Welded Steadyrests supports air- and hydraulic-cylinder tubes on Sellers horizontal mill for finish boring. Tubes 3 to 14 in. dia. to 135 in. long and tubes 16 to 28 in. dia. to 72 in. long can be handled. Each jaw is screw adjusted to center and clamp tube in line with machine spindle Upper halves of steadyrests are removed by overhead crane when tubes are changed. Size is indicated by 12-in. scale beside rear steadyrest. *Logansport Machine Co., Inc.*



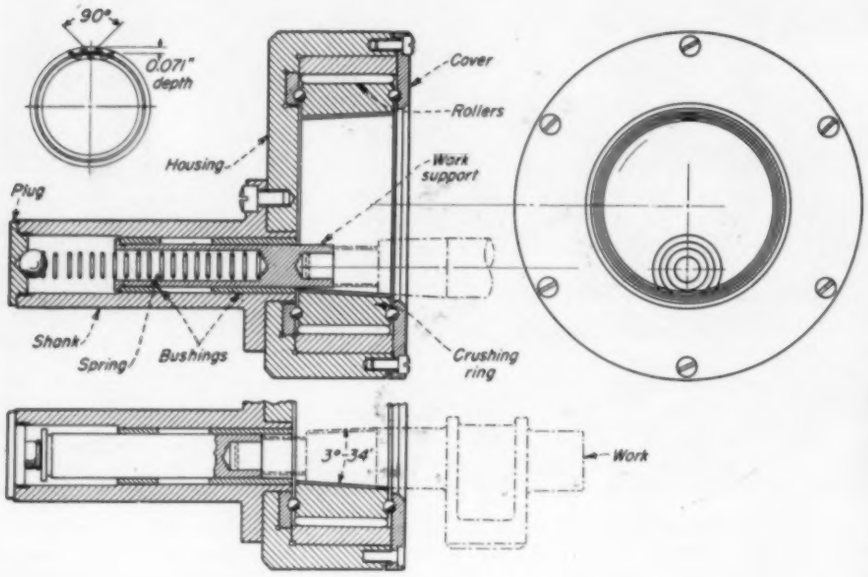


Exhaust and intake ports of cylinder sleeves are milled with solid carbide 2- or 4-lip end mills which slide forward to make starting holes. Work is rotated for horizontal cutting and moved up and down for vertical cutting by two lower levers. Angular milling-head setting gives required angle of ports which are engaged by portions of die during die-casting. Accurate port angle and location prevent bleeding of aluminum alloy into ports and eliminate cleaning operation. *McCulloch Motors Corp.*

←

Slot liners for Life-Line motors are cut from strip stock and folded in Niagara press for easy installation in stator slots. Each edge of fish-paper strip is strengthened with cord and adhesive tape by special unit in foreground. This mechanism handles strip from 1¾ to 6½ in. wide. *Buffalo Div., Westinghouse Electric Corp.*

Practical Ideas



Serrated, Tapered Shaft Produced By Tool Held in Lathe Turret

Tapered, serrated shafts can be manufactured by a number of methods, depending upon the most economical system for the size of the order. Job-lot orders can be filled by cutting the shafts on a milling machine with an indexing head. Larger orders might make a special attachment on a high-speed shaper practical, or a simple hobbing process might be used as an alternate.

The most economical method, however, is a crushing-rolling method by which the metal undergoes a plastic deformation in a cold state. This usually requires a special machine.

A suitable tool can be made for attachment to a turret lathe. This allows many other operations to be made with the same setup. The part is chucked by its small end in the lathe and turning, threading and other operations are done. The serrating is done at a speed of about 120 rpm. with the tool held in the turret.

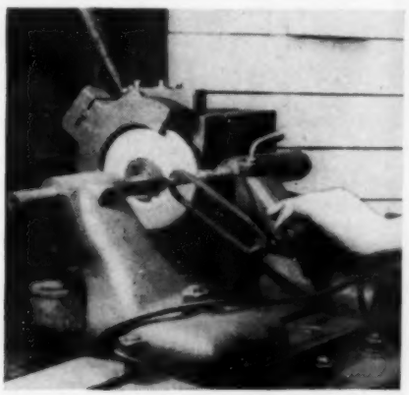
The crushing tool is brought forward until the work enters the tubular work support. A firm bite of the teeth is felt when the crushing ring starts revolving. End pressure may be increased as the tool starts working, as the ring revolves with the work.

The ring is made of hard tool-steel and should be carefully heat-treated. The mechanism must be concentric. Needle bearings are used with the crushing ring, while hardened bushings align the shaft of the tool. The thrust on the ring is carried by two ball-bearing rings. The illustrated job required about 50 seconds actual crushing time. Machine oil was used as a lubricant.

A detail of the serrations produced is shown at the upper left of the drawing. By changing the dimensions of the tool and the shape of the crushing ring variations of the illustrated product can be made. *G. R. Milner, Gainsborough, Lincolnshire, England.*

Hand Tool and Belt Power Grinding Work on Centers

Short, individual jobs like grinding spotfacer pilots, special diameter drills and other unique grinding jobs are often inefficiently done on a universal. Instead of interrupting regular jobs, it is quicker and more economical to set the work between centers on an irregularly used cutter grinder.

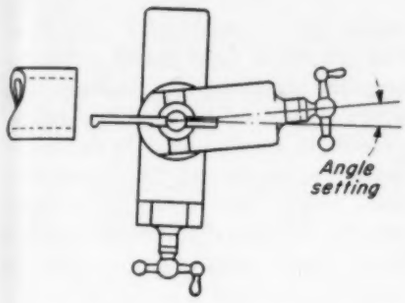


A heavy rubber belt or band transfers rotational power from a small hand grinder or drill to the work. Besides the economy of the setup, any rotational speed can be provided by varying the diameter of the round piece chucked in the hand tool.

The hand tool may be clamped to the center support for long jobs, or can be just held in the operator's hand for quick grinds. Direct drive can be provided by attaching a flexible hose to the center spindle and to the hand tool. Careful alignment is not necessary with such a flexible coupling. *Harold Gates, Carthage Machine Co., Carthage, N. Y.*

Toolslide Set at Angle Makes Accurate Turning and Boring

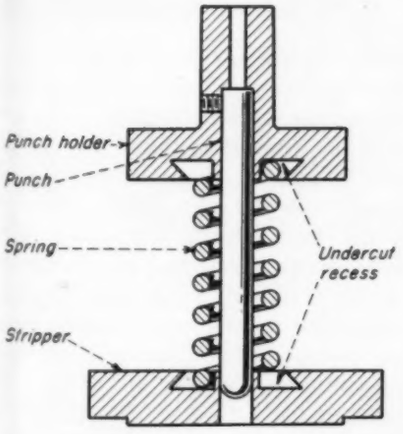
Boring and turning to close limits can be speeded by setting the angle between the lathe centerline and the top slide at a specific angle to



produce a ten-to-one ratio of tool advance to diameter or radius change.

By making this angle 5 degrees, 44 minutes, 21 seconds, the radius is changed 0.0001 in. for each 0.001-in. advance of the tool. A slightly simpler method is to make this angle 11 degrees, 32 minutes, 13 seconds. With this setting a 0.001-in. advance of the tool will change the diameter of the work by 0.0001 in.

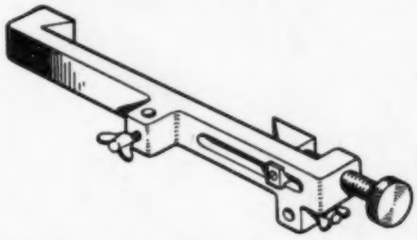
For internal work the setting will be as shown in the sketch. Outside work, or turning, will require the angle to be set on the other side of the lathe centerline. *E. R. Vernon, Calgary, Alberta.*



Small Punch Draws Deep Shell

When faced with the problem of making a simple foot-press die to draw a deep shell we tried this design.

We poured Cerromatrix into the undercut recesses of the punch holder and the stripper. This retained the spring in both undercuts. The stripper was shouldered to nest in the die to hold the stock. This successful arrangement provided sufficient stripper-bolt clearance without bulky machinery. In addition, the punch was well-guided throughout its action. *William Z. Nesin, New York, N. Y.*

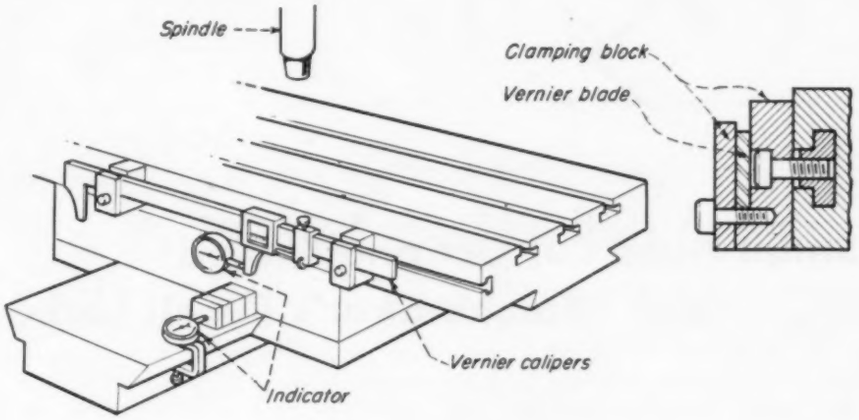


Milling Way Holder for Rods Replaces Height-Gage Setups

Instead of using a height gage mounted on the table of a milling machine for indicating vertical motion, this indicator holder can be attached to the vertical way of the machine. It will position indicating rods or a dial indicator.

The main part of the holder has one dovetail jaw and is tapped at the other end for a movable jaw. Holes drilled in the piece permit the mounting of ⅜-in. (or any other size) rods in either a vertical or horizontal plane, and wing nuts permit tightening.

The original was 12 in. long with a cross section of ⅜ in. by ¾ in. A knurled-head screw made adjustment of the movable jaw quick and convenient. The holder makes vertical alignment more accurate than that made from a scarred and worn machine table. *John Neumann, Canton, Ohio.*



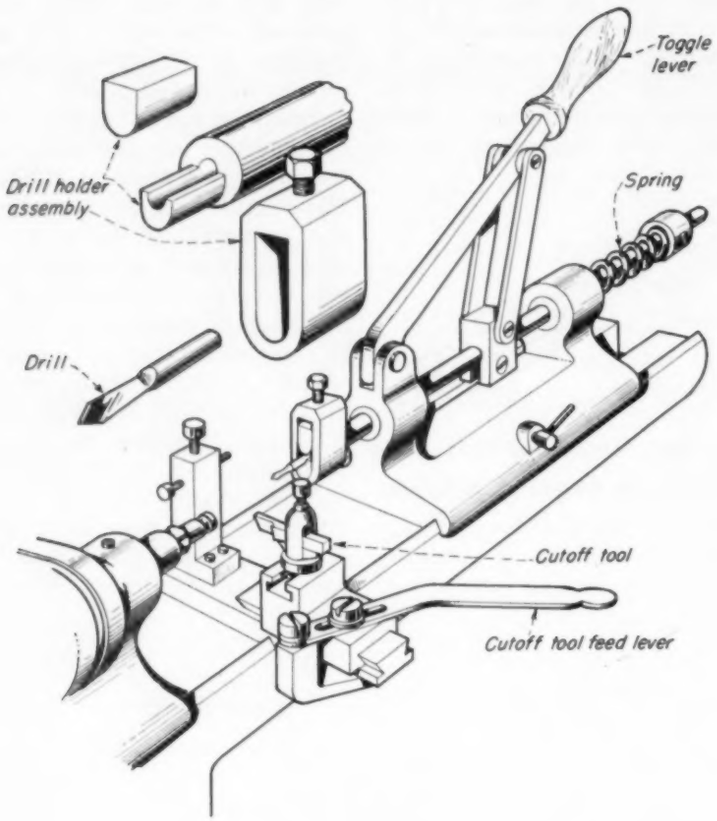
Milling Machine Jig Bores With Accurate Measurement

Vertical milling machines can be converted for jig boring work if they are reasonably new. Addition of an accurate measuring device is all that is necessary.

A vernier caliper is clamped to the front of the milling-machine table by means of special clamps (shown in the detail). These fasten into the T-slot that holds the machine stops. Paper wrapped around the caliper will protect it while clamped.

If the clamps are fastened near the ends of the calipers, the movable jaw will have enough freedom for most work. The table is moved from a fixed starting point by this procedure: The movable jaw is set against a dial indicator mounted on the saddle. The indicator is set to zero. Then the jaw is moved the required distance, locked, and the table is cranked up to it. When the indicator again reads zero the required distance has been covered.

Cross travel of the table is gaged by using a dial indicator in connection with gage blocks, as shown in the illustration. *Chris Sorenson, Racine, Wis.*

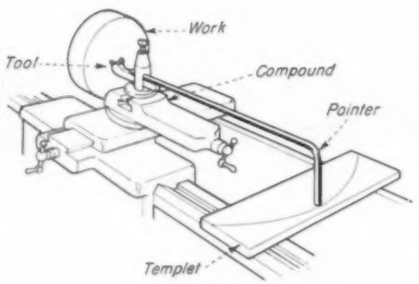


Small Hubs Cut Off and Drilled With Watchmaker's Bench Lathe

The methods we used for producing small pivot hubs in quantity may be of interest to readers. A setup was made on a watchmaker's small bench lathe where the parts were drilled and cut off.

The hubs were cut from ⅛-in. dia. brass stock. The hole was 0.038 in. in diameter, and the pieces were 0.100 in. long. A small cutoff tool of conventional form was employed, but the drill had to be made for the job. It was ground from flat stock to allow centering and drilling in one operation.

A drill holder, shown in detail, was made to make removal of the drill easy. Feeding the drill into the work was eased by the spring-loaded toggle lever mounted over the lathe. A stop back of the work controlled the depth of hole. *Charles H. Willey, Penacook, N. H.*

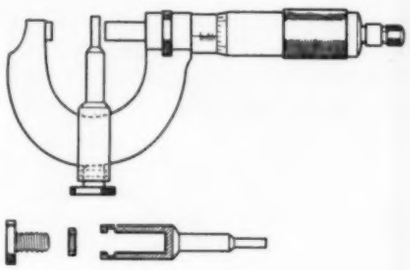


Templet-and-Follower Setup Improved—Simplified Version

The templet-and-follower fixture by F. G. Fonquen published in AMERICAN MACHINIST some time ago can be simplified for short jobs that do not have to be done too accurately.

Instead of using a templet support, simply lay the templet out on a steel plate and lay it on the ways of the lathe. Here it can be either bolted or weighted down. The follower can be made of a long steel rod which is bent down over the templet so it nearly touches the plate. It should be of sufficient diameter to be mounted in the toolholder or bolted to the compound and reach the templet without flexing. If this distance is great, a light angle-iron section can be used.

The tool is ground with a radius equal to that of the pointer. Thus, the scribed templet line can be followed by the inside edge of the pointer and the tool will cut the correct shape. *Lewis F. Cheek, College Station, Texas.*

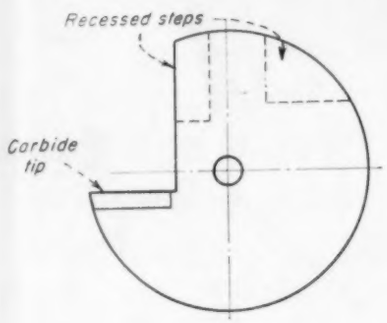


Wall of Small Tubing Gaged With Micrometer Attachment

This attachment for a regular inside micrometer with a flat frame allows measurement of wall thickness of tubing without use of a special gage. Accuracy is as good as usual with the micrometer.

For best results the small end of the device is turned to a nominal diameter, such as ⅛ in., so the correction to the gage reading can be easily made. The base of the attachment is slotted at the end to fit over the center of the frame of the micrometer. Two small slots on the inner walls allow a square nut to fit into the base to provide a removable tightening arrangement. The attachment can thus be removed to permit normal use of the gage.

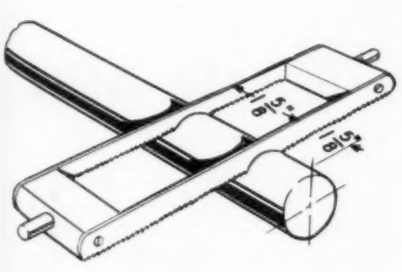
In case the tubing being measured interferes with the anvil of the micrometer, the attachment can be removed to a larger size of gage. *James Cuyler, Pelham, N. Y.*



Screw-Machine Form-Tool Step Protects Carbide-Tool Insert

Automatic-screw-machine circular tools are usually set in place by being clamped lightly in the approximate position, tapped or hammered into the final setting, and clamped finally. This system works very well for high-speed steel tools, but brittle tungsten carbide requires more careful treatment.

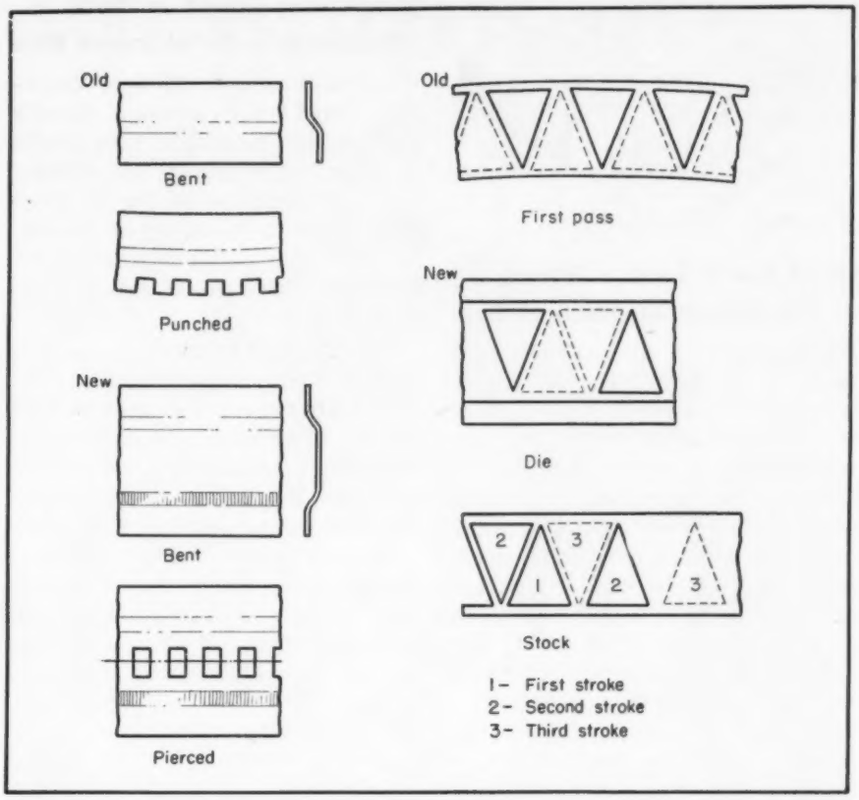
When carbide tips are brazed onto circular tools they can be chipped or broken off by a heavy blow. If a step is cut in the steel circular tool in either of the positions indicated the tool setup can be made by tapping the step, and not the carbide insert. *W. E. Allen, Waterbury, Conn.*



Double Saw Doubles Cutoff

Cutoff work can be doubled in production if the driving mechanism of a power cutoff saw can handle a double load. Two saw blades were mounted on the frame of a saw to cut 6-in. dia. steel bars.

Two spacers were bolted between two blades and the driving mechanism was attached to the spacers. Since the spacers were the length of the required sections our production was doubled. *Stanley Sumski, Belleville, N. J.*



Strip-Stock Distortion Stopped By Punch-Press Methods Changes

Punch-pressing strip stock to form off-center holes or notches usually causes the strip to curve. This defect can be rectified by forming the punchings in such a way that there is no twisting stress to warp the stock.

Long, notched strips were formerly made by cutting the stock to size, forming the offset in a press brake, and press-punching the notches three at a time. The result of having so many notches on one side of the stock was an expansion of the broken edge which caused the strip to curve. A changed production procedure eliminated this effect by punching the holes in the center of the stock.

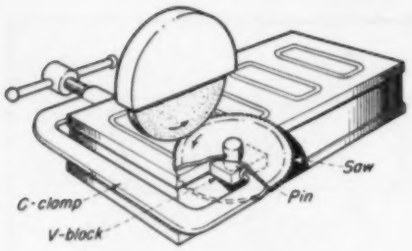
Double-width stock was troughed in a press brake and then punched down the center. The stock was later sheared in half, which produced two lengths of the required shape. Besides the saving in production time, it was no longer necessary to waste effort in straightening the blanked product.

Producing triangular blanks in a punch press by double-running was a poor job because the first pass caused the strip to bend. Both rate of production and quality of the blanks were raised by using two punches, reversed and located two spaces from each other, in the process. This way only one pass was required to get the two lines of blanks and the distortion present had little effect on the work. The strip was moved two blanks —one upright and one inverted— each stroke.

It was impossible to punch two adjacent blanks at the same time because the wall left between the die cavities would have been too weak. The space between punches, therefore, had to equal two blanks.

On this job, too, production was increased by combining passes, and jamming was eliminated because the strip did not bend. *S. Framurz, Bombay, India.*

Practical Ideas



Cutoff Saw is Surface Ground To Reduce Thickness of Edge

Working on an unusual problem recently, we found a good way to grind saws down from their factory size to special thickness. It was managed on a surface grinder.

We needed a thickness of 0.008 in. to a depth of ⅜ in., but the nearest we had was 0.025 in. thick. A pin the size of the bore of the saw was clamped to the side of the magnetic table. The saw was mounted on this pin and was held to the table by magnetic pull. Since the magnet could be adjusted we set the control so that the saw was held firmly, but could be adjusted by hand.

Grinding proceeded at about 0.0015 in. per complete cycle of the saw. With the flat table as a base, the job was done rapidly and accurately. *Norman L. Naidish, Brooklyn, N. Y.*

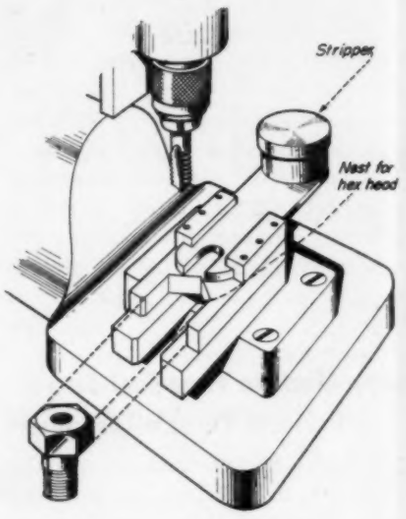
Minute Hole Drilled in Block By Squeezing Metal Around Wire

Watchmaking and jewelery industries constantly produce minute holes in thin metal and hard jewels in countless numbers, but making holes of comparable size in thick steel plate is a different matter. Consider the problem of drilling a 0.003-in. dia. hole in a ⅜-in. annealed block.

The original method was to buzz a drill made from steel wire momentarily against the block at high speed. After about two weeks of constant breaking and resharpening jobs the hole was completed, but the cost was prohibitive.

Instead, a small drill, either a No. 40 or No. 60, was used to drill the hole oversize, and a hardened wire of the correct size was placed in the hole. The block was then squeezed in a tapered die to close the metal around the wire and reduce the hole to the required diameter.

The wire was released from the hole by heating the block, which expanded the hole so the wire could be withdrawn without breaking. Finally, the hole was reamed to final size by a minute reamer. *F. Webster, Scranton, Pa.*



Studs Tapped in Plate Fixture

Special studs with tapped holes in their heads were on order in our shop—20,000 of them. The simple holding fixture that we devised is illustrated above. It was built up of steel plates.

A machined plate was made to the shape of the hexagonal heads to position the studs. Stud shanks slipped into the slot below this plate. Studs were loaded by hand, heads upright. The stripper served to hold the head while the tapping was done. *Charles H. Willey, Penacook, N. H.*

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(in addition to regular payment for all exclusive contributions published)

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Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

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How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

52nd Selection—Chris Sorenson's Jig Borer Block Gage

NEWS OF METALWORKING

Army and Navy Will Get 4,200 Planes by 1950

WASHINGTON — The aircraft industry and its suppliers will receive $3,198,000,000 during the next two years to produce by 1950 more than 4,200 aircraft for the Air Forces and the Navy.

Congress' unprecedented action in increasing the air budget of the military started the production of a 70-group force for the USAF and a 24-group arm of the Navy.

The USAF's procurement experts will use $2,295,000,000 in new appropriations to buy 2,727 new planes, including 243 bombers, 1575 jet fighters, and 909 photo-reconnaissance, transport, training and liaison type craft.

The Navy, with appropriations totaling $905 million for air power, is ordering 1,535 planes, including 807 fighters, 515 attack types, 113 patrol aircraft, 80 helicopters, and 20 transports. About half of these will be powered by jet engines.

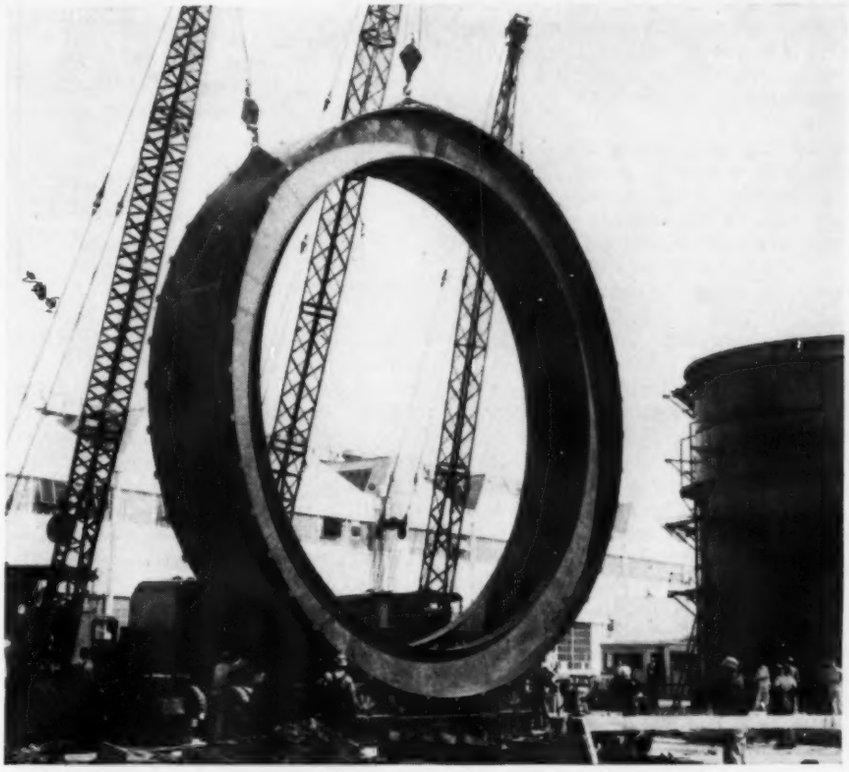
1949 To See Increase

Deliveries of planes will be few during the next 12 months, but will increase during late 1949 and reach a peak in 1950. The Air Forces will take delivery next year on about 1,900 new planes, all but a few of which were built with previous appropriations. About 2,100 of the planes being ordered now will be delivered by July, 1950, according to USAF officials. In the meantime, planes coming off the lines now will be modernized.

Navy deliveries next year will number about 1,200, but only 60 of these will be paid for out of new funds. The other 1,140 will be paid for out of fiscal 1948 funds.

WASHINGTON—The 4200 military aircraft to be produced in the next two years would normally represent one week's work at the wartime level of output.

Obstacles blocking faster production include: more complex designs, shortage of manpower, slowness in obtaining materials such as turbine blades, tapered sheet and the like and political strings on the spending.



***SUPERSONIC WIND TUNNEL'S** central band, 38 feet in diameter, for the vacuum chamber is raised into place at North American Aviation. It is designed to withstand 12 million lbs. of atmospheric pressure on the outside surface*

The new appropriations will start the transition from the present "blacksmith shop" production method to some semblance of war-potential production. Example: Air Forces are buying sufficient new tools and other production facilities for Boeing to boost B-50 production from its present "couple a month" to a potential of 47 a month.

21% for Modernization

Illustrative of how the air arms will use some of the new money to oil up the rusty aircraft production machinery is the USAF breakdown of the extra $822 million. Of the total, 52% will go into procurement of actual planes; 21% for modernization of aircraft now in production; 18% for tooling for additional production for the 70-group force; and 9% for sub-contracting to avoid the expense of opening new plants.

The Navy, in order to get its production level back up to a revised 24-group basis (almost double present strength), is opening nine of its standby plants. These will be run at about 30% capacity, the calculated break-even point for each operation. Of the nine, six definitely have been decided on. They are: the Chance-Vought plant at Dallas, Tex.; Curtiss-Wright's Columbus, O., facilities; Westinghouse plants at Kansas City and Lester, Pa.; Douglas' factory at El Segundo, Calif., and the Trenton, N. J., gas engine laboratory (jet).

The air arms knew they can start building a good, modern defensive air fleet and a fair industrial potential for immediate emergency production with the money they have been granted. But next year even more money will be needed and the program will wither on the vine unless it is appropriated. An improved international situation could clip the fliers' procurement wings —because Congress would use peace as the excuse to stop "rearmament."

Capital Equipment Buying of ECA To Total $1 Billion in 15 Months

WASHINGTON—American industry can now get a pretty good idea of what Western Europe will be buying in under the Economic Cooperation Administration. It comes from estimates presented to the House Appropriations Committee by the administration. Prepared by U.S. technicians, the estimates were worked up chiefly on the basis of what this country could afford to ship abroad.

In capital equipment, the total comes to more than $1 billion for the first 15 months of the program (April 1, 1948 through June 30, 1949). In two major classifications—steel equipment and petroleum equipment—the U.S. is expected to be Europe's only supplier during this 15-month period. However, in other classifications the U.S. is to be only one of many.

A good example is electrical equipment. We'll be sending $95 million worth to Western Europe during the next fiscal year (July 1, 1948 through June 30, 1949). But certain of the Marshall Plan countries themselves—such as Switzerland, the U.K. and Sweden—will be accounting for more than $200-million of electrical equipment requirements.

Here's how the $1 billion plus of capital equipment breaks down (in millions of dollars):

ESTIMATED IMPORTS FROM U.S.
Capital Equipment Group (7/1/48-6/30/49)

	Million
Coal Mining Machinery	$81.9
Steel Equipment	48.1
Timber Equipment	15.9
Electrical Equipment	95.0
Petroleum Equipment	226.7
Machinery, N.E.S.*	565.0
Total	$1,032.6

(* N.E.S.—Not Elsewhere Specified)

Best indication that the figures are only tentative, rather than fixed, is afforded by the "Machinery, N.E.S." classification shown above. This includes road-building machinery, food-processing equipment, shoe and textile machinery, construction machinery, machine tools and other metalworking equipment. It also covers repair parts. However, none of these sub-groups is formally broken down for the simple reason that the data were put together under handicaps of time, incomplete reporting and lack of a functioning organization, either here or abroad.

U.S. technicians will tell you informally, however, that roughly 20% of the $565 million "Machinery N.E.S." group represents machine tools and other metalworking equipment.

During the 15-month period, the European countries are expected to require $6.7 billion of ECA financing. Biggest single slice has been set down for U.K.—$1,671 million. France is next with $1,469 million and Italy is third with $901 million.

Other tentative totals are: Belgium-Luxembourg, $378 million; Netherlands, $778 million; Denmark, $169 million; and Western Germany (including the Saar), $701 million.

Two of the Marshall Plan countries — Portugal and Switzerland — will get along without ECA funds. They're expected to finance their programs through the proceeds of their own exports and out of regular dollar earnings.

ECA to Utilize Normal Trade Channels

WASHINGTON—Normal trade channels will be used in placing machine tool orders for Marshall Plan countries under present ECA plans. The most likely procedure follows:

1. French machine tool users, for example, will put in a request to their government for purchase of a specified number of machines from U.S. builders, stating why these machines are needed.

2. French government screens these requests, determining how essential they are to national recovery. It then satisfies itself that the machines cannot be acquired through sources not dependent upon dollar outlay.

3. The government submits for approval its requests for a specified dollar total of machine tools to the Office of European Economic Cooperation (OEEC) at Paris and then ECA in Washington.

4. France allocates the machine tools among specified users in that country. Renault may be one of the users. Renault then contracts with dealers or agents in France of U.S. machine tool builders and places orders.

5. Necessary dollars are laid aside by French government and import licenses issued. At same time, builders here arrange for export licenses. Since delivery is part of approved program, issuance of licenses should be routine.

6. Machine tools on order go through normal commercial channels, including choice of established freight forwarders.

7. Builder will be paid for his machine by a commercial bank against a letter of commitment from ECA. The builder does this by drawing drafts on the bank, based on documents such as invoices and bills of lading. The bank then collects from the U.S. Treasury.

Japan Seeks U. S. Machine Licenses

TOKYO (McGraw-Hill World News)—Machine tool builders here are anxious to obtain licenses and rights to manufacture American-designed equipment. Through "cooperation" with U.S. machine tool builders they believe that they could get over a severe shortage of design engineers which appears continuing for the next 10 years.

Japanese engineers admire the high standards and specification for materials which now go into American machinery, but they know that Japan can't duplicate these materials now, nor for several years.

Here's how the Japanese Machine Tool Makers Association explained cooperation to AMERICAN MACHINIST:

(1) Several members would like the rights to manufacture American designs. Payment should be on a royalty basis—so much per unit manufactured. They would be willing to set a minimum annual royalty, which would guarantee production of a specified number of units.

(2) In addition to receiving the designs, they need on-the-spot assistance of engineers from the owning company in the United States.

(3) Precision parts, including gearing, bearings and hydraulic units, must be imported.

(4) Additional technical assistance should come from American metallurgists in helping Japan's iron and steel industry produce better materials.

Revision of Japanese patent law would be necessary before such a plan could be consummated and a clarification of royalty payments on previous pirating on the part of Japanese industry would be necessary.

However, preliminary discussions by the end of 1948 with American builders along these lines are anticipated.

Cartel Control Plan Urged On Scarce Material

WASHINGTON—Cartel control of scarce industrial materials is being urged on President Truman as the most feasible way of dealing with defense and foreign-aid pressure on metal supplies.

It wouldn't be labeled that, of course. It would appear as a revision of the floundering voluntary allocation program. Proposal is to amend Taft's voluntary control law to (1) eliminate the Justice Dept. veto on any allocation schemes that look monopolistic, and (2) drop the public hearings now required before any plan goes into effect.

Idea behind all this: If you are going to rely on voluntary measures to take the place of government controls you have to recognize that you are asking industry groups to divvy up orders and supplies—and a cartel, even a government-sponsored one, can't operate efficiently in a goldfish bowl.

This plan may never break into the open. But it's the nearest thing to government controls over production that you need to watch for this year.

The sweeping control plan which Arthur Hill's Resources Board drew up got a flat turndown at the White House.

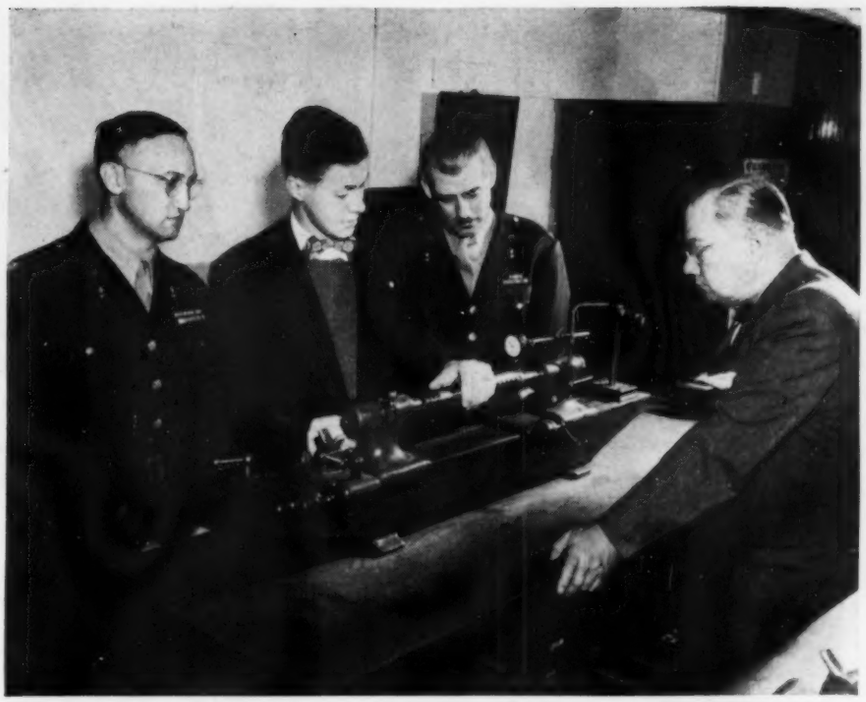
Truman didn't like the way Hill's scheme mixed mobilization controls for future use in wartime with immediate measures to handle present scarcities. He didn't like the idea of having Hill administer controls, and he thought the whole setup threatened too much military dominance.

So now two alternative approaches are being worked out for Truman by a special committee in which Commerce Dept. people have the key spots; they're the ones who opposed the Hill plan.

One proposal would be complete down-the-line allocation of steel and the major non-ferrous metals. If you want to allocate at all, the government boys figure, you've got to go whole hog.

By the time you take care of government and foreign programs and key industrial expansion, you've grabbed off nearly half the steel. You can't just let people scramble for the rest.

No one thinks real allocation could get through Congress, but Truman may go for it anyway. It would be a political sop to New Dealers and would put him on record with a program that might look good in November if industry had tied itself in knots meanwhile.



***GAGE CONFERENCE** sponsored by New York Post of the American Ordnance Association at New York University, May 21, included inspection trip through laboratory for gaging research and experiments. The laboratory is available for industrial research at a moderate charge*

Court Refuses Decision on Status Of Workers in U. S.-Owned Plants

WASHINGTON—The war has been over almost three years, yet there has been no final court answer to two questions: (1) Were employees, in a government-owned plant operated under a cost-plus-fixed-fee contract, working for the private contractor or the War Dept. which let the contract? and (2) Were the munitions they made "goods" produced for "commerce" within the meaning of the Fair Labor Standards Act?

Inspectors, Foremen Involved

This week the U. S. Supreme Court put off answers to those questions which were raised in a suit for premium overtime pay brought against Silas Mason Co. of Minden, La., by a group of inspectors and foremen employed in the plant it operated for the government during the war.

By an 8-to-1 majority, the court refused to accept the case and sent it back to the district court for "reconsideration and amplification of the record."

Reason: the lower courts, which ruled against the former employees, failed to clarify the issue involved. Justice Black, dissenting, thought that the high court should have reversed the Fifth Circuit Court of Appeals.

FLSA exempts government employees from time-and-a-half for overtime. On the other hand, a national defense law of July 2, 1940, says that "laborers and mechanics" employed by the War Dept. under cost-plus-fixed-fee contracts should get the premium overtime pay.

The company and the War Dept. contend that the employer's liability is controlled by the 1940 law. The district court agreed. But there was this hitch: the workers had not argued that law, thus the court could not use it as a basis for deciding in their favor and so ruled against them.

War Dept. To Lose

Other unusual aspects of the case: the War Dept., rather than the company, stands to lose by the decision since it must reimburse the company for all costs. The decision would serve as a precedent for many other cases and involve great cost to the government. Arguing against the War Dept. are its own lawyers and the Dept. of Justice, who in this situation also speak for the wage-hour division.

***GARGANTUAN MAXIPRESS** for mass production of automobile crankshaft forgings weighs 530 tons and was built by the National Machinery Co., Tiffin, Ohio. A workman is shown scraping a main bearing and on the right the main drive gear, weighing 19,000 lbs. and 12 ft. in diameter, is shown*

Keep Informed, NTDMA is Urged

NEW HAVEN—Leaders in small industry must exert themselves in several directions if they expect a continuance of the free enterprise system, according to Herman Steinkraus, president, Bridgeport Brass Co. As speaker at the 4th annual New England Conference of the National Tool & Die Manufacturers' Association, Mr. Steinkraus made these points:

1. Every small shop owner or manager should understand the history of the labor movement, where it is going, and the legislation that may be introduced to control unions and employers, as that his own men will be affected by decisions or developments applying to labor in mass-production shops.

2. Small-plant owners, working in concert, can do more than large local industries to improve community conditions. The future of industry, according to Mr. Steinkraus, depends in good measure on how good a job it does of creating good will in the local community. If the employee is proud of the place he works for, and the local living conditions and schools are good, there will be less stress in crucial times.

3. Tool-shop managers should take a more active interest in national affairs, because 30% of total business now done in the country is handled by Federal departments and the proportion will grow larger unless tireless minorities seeking to force government further into business are checked.

Approximately 350 persons, members of NTDMA shops in New England and guests, attended the conference. Toastmaster was Richard F. Moore, president of the Moore Special Tool Co., and a past-president of the association.

Monarch Offers 15 Scholarships

SIDNEY, OHIO—Three scholarships will be awarded yearly for the next five years to boys graduating from Shelby County schools by the Monarch Machine Tool Co. to enable them to study mechanical or electrical engineering at any leading college or university.

The awards, $2,000 each, will be made to youths of high scholastic records by a permanent board of trustees. The money will be divided into four allotments of $500 yearly over four years of study. Monarch has set aside a $30,000 fund for this work.

Three conditions must be met by the applicants for these awards:
1. Superior scholastic performance
2. Seriousness of purpose
3. Aptitude for work.

India Bans Private Purchases of Steel

NEW DELHI, India (McGraw-Hill World News)—Virtual abolition of private imports of iron and steel from America appears to have been decided on by the Indian government in an attempt to speed deliveries and hold down prices.

The Indian Purchasing Mission in Washington is placing orders for almost all the steel allocated to India, and no new import licenses are being granted to private firms.

Foundry Exhibit Attracts 13,000

PHILADELPHIA — Equipment designed to save effort or to make foundries better places in which to work captured the attention of 13,000 visitors to the 52nd annual convention and exhibit of the American Foundrymen's Association May 3-7.

Pangborn Corp. showed a "Continuous-Flo" Rotoblast machine whereby rough castings are dumped on a conveyor, transported into a spiral-drum barrel for blasting and discharged as cleaned work. The same general idea was also seen in equipment made by the American Wheelabrator Co.

Herman Pneumatic Machine Co. had a model of an installation in a sanitary-ware plant where 19 men now make 300 cast-iron bathtubs a day instead of 150. This installation prepares sand, flash and drag, sets cores, pours, shakes out, etc.

Yale & Towne had a fork truck with rotating attachment to hold a large ladle for pouring molds along a conveyor on the floor.

To cut sprues and risers, Fox Grinders now has a swing-frame machine that uses flexible grinding wheels.

To snag castings, Standard Electrical Tool Co. exhibited a double-wheel machine with independent belt-motor drives to the two spindles and means to change the speed as the wheels wear down.

Induction Heating Corp. has made its conveyor core-baking oven effective for small fragile cores by developing a plastic support, or drying plate, which reduces high-frequency losses.

Whiting Corp. introduced a "Hydro-Clone" dust collector.

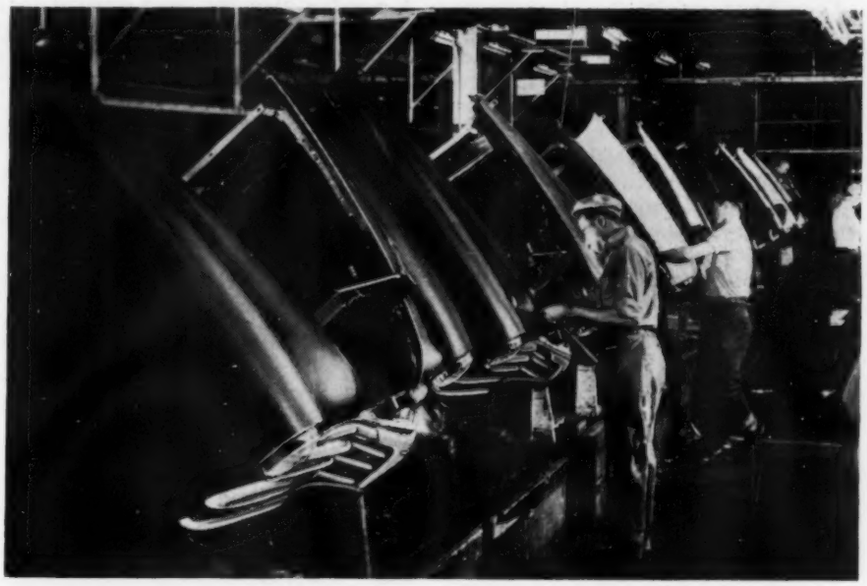
Detroit

STRIKES, STEEL SHORTAGES SLASH CAR OUTPUT... LEVEL OF EMPLOYMENT MOUNTS ... INVENTORIES REPORTED RISING

Labor clouds are low and angry over Detroit, and their end is not in sight. Beyond the present run of difficulties lie the oncoming negotiations between Ford and the United Auto Workers Union (C.I.O.), and militancy beyond that in supplier companies.

Strike interruptions and steel shortages have combined to bring the estimates of 1948 calendar year output lower and lower. There are no firm anticipations any more, and so many qualifications on the future that it is impossible to say anything beyond the fact that volume will doubtless be well below the projections of 5½ million cars and trucks which were so readily made—and with good reason—at the start of the year. Some doubts are now being expressed that the aggregate will surpass 5 million.

Ford is back in production now, building 1949 models which will be publicly shown within the next fortnight. This changeover was made with a minimum of lost motion—only 11,200 Rouge employes were off at any one time during the period from mid-February until the end of May.



***CONVEYERIZED WIRING** speeds front-end automobile assemblies to final line at Chevrolet-Tarrytown's plant. Normally stationary fixtures are used*

Employment Near Peak

Aided by this steadiness, Detroit employment had reached close to its best postwar level, rising to a mark of 142.3 as of April 30 on the Detroit Board of Commerce index just before the Chrysler strike began. Except for the 142.8 level of Feb. 29, this was the best showing since spring of 1945. The index is based on the 1923-25 average equaling 100; its Apr. 30 level shows Detroit area industrial employment of about 485,000 persons.

Auto people are keeping close watch on the demand for household appliances. Demand for this class of consumer goods seems to be sloping somewhat, and if this tendency continues it will loosen a little steel which may be diverted into automotive channels.

This seems to be about the only hope for enlarged tonnage this year. Due to the coal strike, steel production for the 12 months (despite facilities which have recently come into play or shortly will) does not seem to be headed for quantity notably larger than in 1947. Meanwhile, demand continues heavy.

In the light of the uncertain conditions, purchasing agents are covering themselves for the medium term. Both hand-to-mouth and long-term buying (the latter meaning from six months upward) are dwindling in late reports from the Purchasing Agents Assn. of Detroit. The level of buying seems to be centralizing around two months ahead, where about 40% of those reporting are operating.

Inventories Modest

Other reports of this same group indicate a modest building of inventories. Their credit reports show a minor tightening. Prices, as they see them, are still moving slowly upward.

In spite of the headaches of today's automobile manufacturing business, capital is willing to get into it. A recent tabulation shows that 23 new companies have been set up to enter the business. Their aims go all the way from motorized rickshaws for Chinese distribution, through three wheelers, and up to flying cars, equipped with detachable wings for movement in the air or on the highways.

The independent producers are taking full advantage of the sunny sales weather. Packard, Hudson, Willys, and Studebaker all had good tidings to report during May.

Packard Sales at Peak

From Packard came the word that factory sales in April were the highest for the postwar period, marking the second monthi in a row in this respect. With somewhat improved supplies of steel finally coming to the plant, production amounted to 9,269 units, and the hourly rate was further boosted early in May. The first four months of the year saw 27,206 units produced, compared with 16,020 in the like 1947 period and with 55,477 in all of last year.

Hudson is beginning to get the first steel shipments from its new steel-making subsidiary plant. When these start to flow in larger volume before too long, notable schedule enlargements will be possible. The company capacity is 1,000 units per day (current output averages 600), and the hope is to reach this mark by the end of the year.

At Willys, output has begun on the jeepster, the company's new sport phaeton. May saw about 25 of the jobs completed, simply to test assembly lines. Output of 500 is scheduled for May, and of more than 15,000 by the end of the year. Expectations are that it will be priced in the neighborhood of $1500, delivered in Toledo. Formal introduction will take place in July.

Jeep Sales Set Record

Meanwhile, jeep sales established a record in April, when 4,981 units were sold. More than half go to agricultural pursuits, factory studies show, the balance being divided between industrial and general usage.

At Studebaker the wraps were taken off a new line of trucks which the company feels will be as great a hit as were its passenger cars when they were introduced shortly after the war ended.

Unions Seek to Avoid Showdowns As Management Resistance Grows

WASHINGTON—Stiffened management resistance to third-round wage increases in major industries changed the pattern of 1948 contract negotiations from what was anticipated a few months ago.

Instead of easy settlements, unions find they have the choice of little or no increase or of striking and they are trying to stall a showdown wherever possible. The flat glass industry and the CIO put off a wage settlement until July 1. Telephone unions are signing three-year contracts without a wage increase at this time, although increases may be sought twice during the three years.

Where strikes have occurred, they are being lost in most cases. Examples: meatpacking, Caterpillar Tractor, precision castings, Wall Street, overseas cables.

Chrysler Offers Showdown

The Chrysler strike, however, offers the showdown test for the CIO auto and electrical workers. It may also have some bearing on what the steel workers might get later this year should the cost of living continue to rise. The inclination of CIO leaders is to hold off strikes against other major companies in metal-fabricating industries until the Chrysler settlement.

An alert eye is also kept on John L. Lewis' negotiations for a third-round wage boost in both soft and hard coal mines. The deadline here is early July.

Meanwhile, the union leaders are turning more and more to pension plans. Stimulus for this comes from the $100 monthly pensions won by the rival Lewis for his United Mine Workers and by the denial of another increase by the U.S. Steel Corp. to steel workers.

U.S. Steel and the CIO steel workers have for a year been studying the possibilities of a social insurance plan which would cover life insurance, hospitalization, medical care and sick benefits for workers and their families.

President Philip Murray of the CIO steel workers told 3,000 delegates to the Fourth Biennial Convention in Boston that the union has proposed a plan costing about 9.65 cents an hour.

Steel Pension Drafted

The plan which U.S. Steel agreed to study in the 1947 contract did not include pensions. The union, however, has not overlooked them. A pension plan has been drafted for the union by Murray W. Latimer, former chairman of the Railroad Retirement Board.

The plan, which Murray told convention delegates would be presented to the steel industry, calls for pensions of $150 a month, with retirement at 65 optional. Murray's estimate of the cost is 13.5 cents an hour. Total cost of both social insurance and pensions, Murray said, is 23 cents an hour.

Only 13 Include Pensions

A study of 50 employee-benefit plans in use a year ago by 36 basic steel companies has been completed by the Federal Security Agency. Only one, at Allegheny Ludlum Steel Co., has since been made part of a union contract. Most of the plans cover such items as death and sick benefits and hospitalization. Only 13 include pensions.

But management can expect to get union demands for negotiation on pension and other benefit plans. The National Labor Relations Board decided in the Inland Steel Co. case that employers must bargain on such issues when requested.

The Inland case involved two plants organized by the CIO Steel Workers. NLRB conditioned its order to bargain in this particular case on compliance by the union with the non-Communist affidavit requirements of the Taft-Hartley Law within 30 days.

Convention Opposed

The Boston convention decided against compliance, for the time being, and to make a court test of the affidavit rule. Possible compliance in the future was left to the union's executive board.

In order to narrow the issue and make the test on the affidavit requirement alone, the steel union has (1) complied with two other sections of the law requiring the filing of financial and organizational reports with the Labor Dept., and (2) amended its constitution to bar Communists and Fascists from holding union office.

Dues for 892,000 dues-paying members were boosted from $1.50 to $2 a month. Murray and other paid officials also got salary rises—Murray from $20,000 to $25,000, Vice Presidents Van A. Bittner and James G. Thimes and Secretary-Treasurer David J. McDonald from $12,000 to $15,000 and the 36 district directors from $6,000 to $8,000.

L. A. APPLEY

Lawrence A. Appley, former deputy chairman and executive director of the War Manpower Commission, has been named to succeed Alvin E. Dodd, president of the American Management Association

Supersonic Wind Record Reached

ABERDEEN PROVING GROUND—A supersonic wind tunnel with flexible throat now in operation here has produced speeds of four times the speed of sound. This was revealed at dedication ceremonies for the new tunnel which were attended by Army, Navy, Air Force, and industry leaders.

The design of the tunnel throat determines the speed that will be attained. Thus a new throat normally must be installed for each change of speed. This takes, in the larger tunnels, as much as several days. The new tunnel has fixed vertical walls in the throat. The top and bottom are ¼-in. spring steel sheets which are each positioned by 16 jacks. Throat contour can be changed in a few minutes to any desired shape accurate to 0.001 in.

The tunnel is powered by five compressors totaling 13,000 hp. The tunnel is the first to reach speeds of four times the speed of sound (Mach 4). It will be used for the testing of bombs, shells, rockets, guided missiles, and aircraft. Models mounted in the tunnel are photographed by the Schlieren camera which reveals irregularities of air flow and are also checked mechanically by the balance mechanism to which they are attached.

Also revealed is completion of the stratospheric facility which contains the largest firing chamber in the world capable of simulating temperature and pressure changes occasioned by the fastest aircraft.

Names in the News

Howard M. Hubbard

A. B. Vestal

Howard M. Hubbard has been elected president of Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Mr. Hubbard is a former president of the Elliot Co., Jeanette, Pa., and of Greenfield Tap & Die Corp., Greenfield, Mass.

Joseph P. Costigan has been appointed assistant works manager of the Standard Stoker Co., Inc., plant, Erie, Pa.

Lawrence R. Rothert has been named director of machine tool engineering at Kent-Owens Machine Co., Toledo, Ohio.

Allen W. Lovell, general manager, has been elected vice president of Modern Collet & Machine Co., Ecorse, Mich.

Edward M. Griffith has been appointed vice president of the Jessop Steel Co., Washington, Pa., and **Curtis A. Gordon,** general works manager.

Harold L. George has been elected vice president and general manager of the Hughes Aircraft Co., division of Hughes Tool Co., at Culver City, Calif.

D. W. R. Morgan, Philadelphia, and **John K. Hodnette,** Sharon, were elected vice presidents of the Westinghouse Electric Corp. recently. **E. V. Huggins** was named secretary.

Charles W. Bentley has been named assistant to the manager of the General Electric Co.'s new Decatur, Ill., plastics molding plant. **Frank E. Golliher** has been named production supervisor.

A. B. Vestal has been added to the management staff of Firth Sterling Steel & Carbide Corp., McKeesport, Pa.

H. S. Hagan has been appointed acting manager of the Butler, Pa., plant, Pullman-Standard Car Mfg. Co., replacing **R. M. Fox,** who has been granted a leave of absence. **W. C. Roederer** has been named district manager of the St. Charles, Mo., plant.

George Rosen has been promoted to chief aerodynamicist of the Hamilton Standard Propeller Division, United Aircraft Corp., East Hartford.

Philip A. Bohlander has been appointed assistant works manager of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

P. A. Bohlander

Jack L. Stafford has been appointed director of manufacturing of the Bassick Co., Bridgeport.

Edward R. Hall has been elected vice president and assistant general manager, Shops Division, Koppers Co., Inc. **Arthur C. Thompson** has been named works manager.

E. S. Ronk, sales manager, has been named general manager of Bowser Inc., Refrigeration Division, Terryville, Conn., succeeding **M. J. Kennedy** who has accepted a position with Renfrew Electric Co., Renfrew, Ont., Canada.

Wendell G. Fogg has been appointed executive engineer of the Air Reduction Sales Co., New York City.

W. O. Mitchell has been appointed plant manager and engineer of the Shiffler Plant, American Bridge Co., Pittsburgh.

Stuart N. Smith has been appointed general superintendent in charge of manufacturing of the Twin Coach Co.'s Buffalo, N. Y., Division.

R. Wade Willey has been named vice president and general manager of Clyde Porcelain Steel Corp., Clyde, Ohio.

Lawrence F. Black has been appointed assistant chief engineer of American Steel & Wire Co., Cleveland, and **Charles B. Hull,** assistant division engineer.

William S. Saylor has been named manager of sales, Detroit District sales office, Carnegie-Illinois Steel Corp.

W. Earle Bartholomew, former methods engineer for Sterling Engine Co., Buffalo, has been named administrative assistant to **Edward C. Miller,** manager of the Buffalo plant, Ford Motor Co.

Charles A. Russell, superintendent of the Columbus Plancor Plant, Timken Roller Bearing Co., has been promoted to assistant superintendent, Columbus plants.

W. F. Detwiler, chairman of the board of directors of Allegheny Ludlum Steel Corp., has been named honorary chairman, and **Lester H. Bittner,** vice president in charge of purchases.

J. F. Donahue has been elected executive vice president of the Lamson & Sessions Co., Cleveland, Ohio; **G. S. Case, Jr.,** vice president and treasurer; **R. G. Patterson,** vice president, and **J. M. Rowe,** vice president.

Lawrence M. Muse has been named assistant general manager, Industrial Division, Sherwin-Williams Co., Cleveland.

Lawrence M. Muse

Felix Wunsch, Leeds & Northrup Co., engineer, retired May 7.

J. J. Stephens, treasurer and general manager of Carlisle & Hammond Co., has been elected president, succeeding G. J. Zimmerman who retired last October.

BUSINESS ITEMS

Ampco Metal Inc., Milwaukee, has appointed the following distributors: Car Parts Depot, El Paso, Texas; Eagle Metals Co., Seattle, Wash., and Gibson Welding Supplies, Spokane, Wash.

Whiting Corp., Harvey, Ill., has taken over the business and plant of Spencer & Morris, Inc., Los Angeles, manufacturers of materials-handling equipment.

Reypo Corp., Los Angeles, Calif., has consolidated main office and factory in a new building.

Waltham Grinding Wheel Co., Waltham, Mass., has moved its Detroit factory branch to Hazel Park, with Walter W. Hayden manager.

Link-Belt Co. has opened a district sales office in Albany, N. Y. J. Charles Bullock has been appointed manager.

Rockford Mfg. & Enameling Co., Rockford, Ill., has changed its name to Rockford Acromatic Products Co.

Borg-Warner International Corp. will handle exports for automotive products of Hoover Ball & Bearing Co., Ann Arbor, Mich.

Brown Instrument Co., Philadelphia, will add 60% to its manufacturing space with a $2.5-million-expansion program. A four-story addition to the main plant at Wayne Junction is included in the program.

Optimus Equipment Co., Matawan, N. J., manufacturers of metal parts vapor degreasers, washing and drying equipment have joined with the Midwestern Mfg. Co., New York, N. Y., and the new company will operate under the name, Optimus Equipment Co., with headquarters in Matawan. Officers of the new concern are: V. W. Todd, chairman of board; M. Jaffa, president; A. T. Baldwin, vice president, and E. N. Close, secretary and treasurer.

Production Aids, Inc., North Hollywood, Calif., has purchased factory buildings and land in Van Nuys, Calif., from AC Mfg. Corp. to expand production facilities of materials-handling equipment.

Acro Welder Mfg. Co., Milwaukee, Wis., has been acquired by a group headed by J. C. Wilson, Jr., who was elected president of the reorganized company. L. R. Matthews, was elected vice president, W. C. Messinger, secretary; J. C. Wilson, Sr., treasurer, and T. B. Wilson, assistant secretary-treasurer.

Anker-Holth Mfg. Co., Port Huron, Mich., manufacturers hydraulic cylinders and other allied products, has been purchased by Jay Creswell, president of Pneumatics Inc.

Rowan Stamping & Machine Co. has been formed in Cuyahoga Falls, Ohio, to manufacture metal stampings. Officers are: Ralph Crosby, president; Malcolm Rowan, vice president and treasurer, and Don Richard, secretary.

United Aluminum Castings Co. is moving to Berea, Ohio, from Cleveland.

Harry L. Showalter

Girard Associates has been formed by Harry L. Showalter, Jr., specialist in sales and engineering related primarily to the forge and press shop field.

Vulcan Detinning Co., Sewaren, N. J., will build a tin smelting plant, the first privately-owned one in the country, on the grounds of the present plant.

Peal Mfg. Co., Cincinnati, Ohio, has acquired the Utensil Division Steel Materials Corp., Detroit and Cincinnati.

H. C. Hook Co., Inc., Worcester, Mass., has been appointed sales representative for the Nilsson Gage Co. Poughkeepsie, N. Y., in the states of Maine, New Hampshire, Vermont, Rhode Island and Massachusetts. Homer L. Lalock has been named sales representative in the Buffalo and Rochester area.

OBITUARIES

Charle E. Perkins, 61, general superintendent of the Buffalo Arms Corp. during the last war, died May 12, while on a business trip in the Midwest.

Percy Hunter Neville, 62, director, vice president and treasurer of the Leece-Neville Co., died May 12 at his home, Henrietta, Texas.

Edward F. Loges, 67, died recently in Dayton, Ohio. He was secretary-treasurer of Kramer Bros. Foundry Co. since 1906.

Swen W. Nelson, manager, Buffalo office, Bailey Meter Co., died in April.

Embury A. Hitchcock, dean emeritus of Ohio State University's College of Engineering, died recently in the University hospital.

Louis S. Hamilton, 63, founder and president of Hamilton Equipment Co., died recently in Salt Lake City. He formerly was manager of the Western Machinery Co.

A. Fred Morris, chairman of the board of Morgan Engineering Co., Alliance, Ohio, and former president, died recently.

Peter D. White, president of the Babcock & Wilcox Tube Co. since April 8, died May 6 en route from the Beaver Falls, Pa., plant to the Alliance (Ohio) plant.

S. Elmo Gross, 73, retired secretary-treasurer, Foote-Burt Co., died at his home in Cleveland, May 15.

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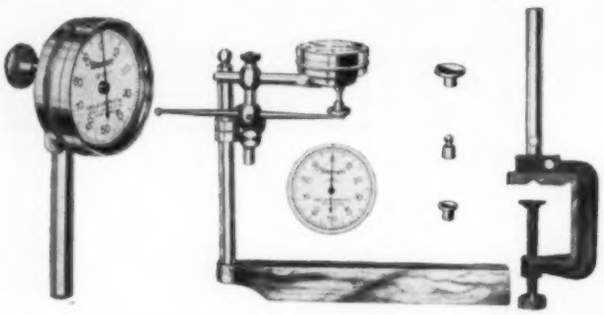

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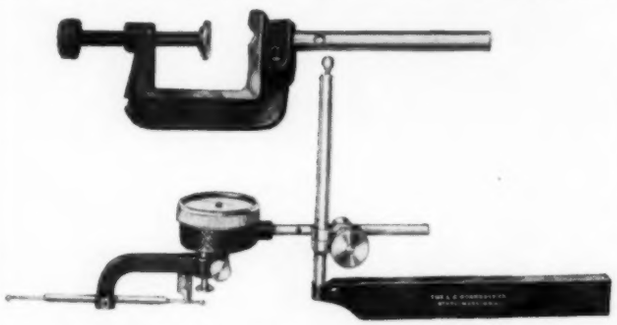

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CARBIDE DRILLS—I

BY FRED W. LUCHT
DEVELOPMENT ENGINEER
CARBOLOY COMPANY, INC.

Carbide drills of the "all depth" type resemble gun drills, but these tools provide means for obtaining exceptionally high production rates for drilling all manner of holes in many metals. They permit the use of higher feed rates and have a long life between grinds. They are useful for shallow holes, where a chip problem may develop; they permit drilling larger holes from the solid, and they will drill closer to desired size.

Sizes for Two Kinds

Table I lists the drill sizes ordinarily made in the solid-carbide type of drill, Fig. 1, whereas Tables II and III give the same information for the wear-strip types, Figs. 2 and 3. All three types are designed for connection to a drill tube or drill bar, as the case requires, so that oil can be fed to the cutting edges at high pressure to wash out chips.

The wear-strip type of drill is made with one carbide cutting tip and two carbide wear strips located 90° and 183° behind the cutting edge, respectively. This type of drill is easier to fabricate than the solid-carbide type, and, moreover, it is attachable to the same size of drill tube.

Wear-strip drills are of two sorts: the brazed type, Fig. 2, and the detachable type, Fig. 3. The brazed type is meant to be silver soldered to the drill tube by either of two methods shown in Figs. 4 and 5, whereas the detachable type is connected to and driven by a Pratt & Whitney drill bar, Fig. 6.

General Design

Grind the O.D. of all carbide-tipped all-depth drills to an included back taper of 0.0006 in. per in. After the O.D. has been ground, a longitudinal clearance should be ground along the cutting tip, leaving a circular land below the cutting edge. This land *J*, Figs. 2 and 3, should vary from 0.030 in. wide for a 0.290 in. drill to 0.050 in. wide for a 3-in. drill. Never touch this land when sharpening the tool.

The O.D. of the steel bodies should be about 2% smaller than the drill size. And the cutting edge

FIG.1 SOLID CARBIDE TYPE

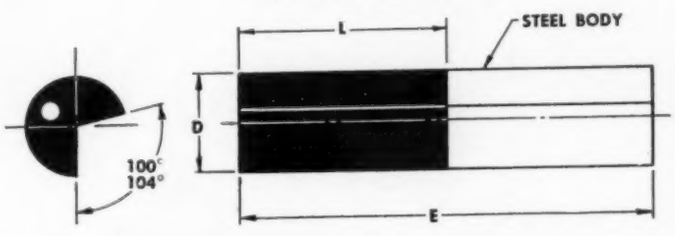

Fig. 1—A preformed solid carbide blank is copper brazed to a steel shank of sufficient length so that the joint will not be weakened when the other end is brazed to a drill tube

TABLE I

Diameter D	Length Carbide L	Overall Length E
¼	¾	1 1/16
.2905 30 cal.	13/16	1 13/16
5/16	⅞	1 ⅞
⅜	1	2 1/16
7/16	1 1/16	2 ¼
.487 50 cal.	1 5/16	2 ½
½	1 5/16	2 ½
9/16	1 ⅜	2 9/16
⅝	1 5/16	2 ⅝

TABLE II

Diameter D	Overall Length E	Carbide Cutting Blank T	Carbide Cutting Blank L	Carbide Wear Strips F	Carbide Wear Strips G	Carbide Wear Strips H
.2905 30 cal.	1 13/16	3/64	5/8	1/32	3/64	¾
5/16	1 ⅞	3/64	5/8	1/32	3/64	¾
⅜	2 1/16	1/16	1 1/16	1/32	3/64	¾
7/16	2 ¼	1/16	1 1/16	1/32	3/64	⅜
.487 50 cal.	2 ½	3/32	⅞	3/64	1/8	1
½	2 ½	3/32	⅞	3/64	1/8	1
9/16	2 9/16	3/32	1 5/16	3/64	3/16	1 1/8
⅝	2 ⅝	3/32	1	3/64	3/16	1 1/8
1 1/16	2 11/16	3/32	1 1/16	1/16	¼	1 ¼
¾	2 ¾	1/8	1 1/8	1/16	¼	1 3/8
.760 20 mm.	2 ¾	1/8	1 1/8	1/16	¼	1 3/8
13/16	2 13/16	1/8	1 1/8	1/16	¼	1 3/8
⅞	2 ⅞	1/8	1 ¼	3/32	3/16	1 7/16
15/16	3	1/8	1 ¼	3/32	3/16	1 7/16
1	3 1/16	3/32	1 7/16	3/32	3/8	1 5/8

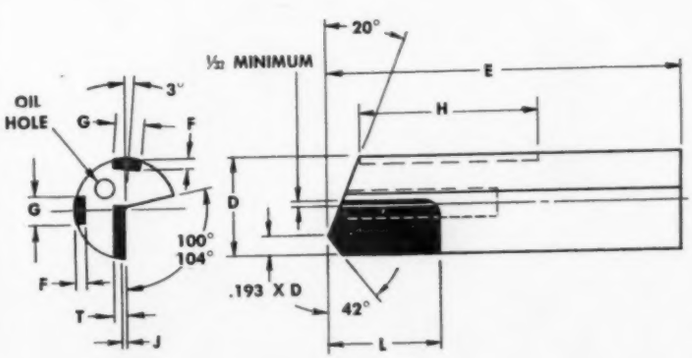

FIG.2 WEAR STRIP—BRAZED TYPE

Fig. 2—This type of wear-strip, all-depth drill is attached by brazing to the same size of drill tube as the solid carbide type shown in Fig. 1

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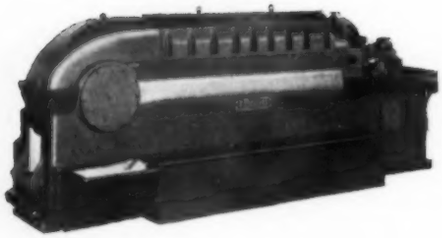

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CARBIDE DRILLS—II

TABLE III

Diameter D	Length B	Shank Diam. A	Shank Length C	Overall Length E	Carbide Cutting Blank Thickness T	Carbide Cutting Blank Length L	Carbide Wear Strip Thickness F	Carbide Wear Strip Width G	Carbide Wear Strip Length H
1 —1 7/64	2 3/8	5/8	1 1/8	3 1/2	5/32	1 7/16	3/32	3/8	1 5/8
1 1/8—1 15/64	2 1/2	1 1/16	1 1/8	3 5/8	5/32	1 7/16	1/8	3/8	1 3/4
1 1/4—1 23/64	2 11/16	3/4	1 1/4	3 13/16	5/32	1 7/16	1/8	7/16	1 7/8
1 3/8—1 31/64	2 13/16	7/8	1 1/4	4 1/16	5/32	1 7/16	3/32	7/16	2
1 1/2—1 39/64	3 1/16	1 1/16	1 1/4	4 3/16	3/16	1 11/16	3/32	1/2	2 1/16
1 5/8—1 47/64	3 3/16	1	1 1/4	4 7/16	3/16	1 11/16	5/32	1/2	2 3/16
1 3/4—1 55/64	3 3/8	1 1/8	1 1/4	4 5/8	3/16	1 11/16	5/32	1/2	2 5/16
1 7/8—1 63/64	3 5/16	1 3/16	1 1/4	4 13/16	3/16	1 11/16	3/16	9/16	2 7/16
2 —2 7/64	3 3/8	1 1/4	1 3/4	5 3/8	7/32	1 15/16	3/16	5/16	2 1/2
2 1/8—2 15/64	3 7/8	1 3/16	1 3/4	5 5/8	7/32	1 15/16	3/16	5/16	2 5/8
2 1/4—2 23/64	4	1 3/8	1 3/4	5 3/4	7/32	1 15/16	7/32	5/8	2 3/4
2 3/8—2 31/64	4 3/16	1 1/2	1 3/4	5 15/16	7/32	1 15/16	7/32	11/16	2 7/8
2 1/2—2 39/64	4 1/4	1 1/2	1 3/4	6	1/4	2 3/16	1/4	11/16	2 15/16
2 5/8—2 47/64	4 7/16	1 5/8	1 3/4	6 3/16	1/4	2 3/16	1/4	3/4	3 1/16

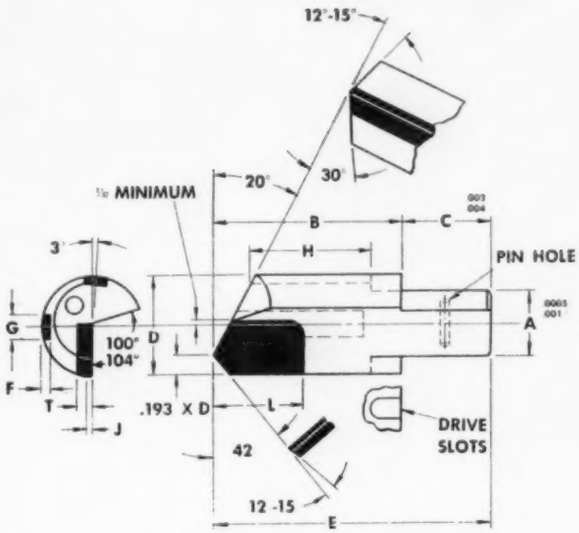

FIG. 3 WEAR STRIP DETACHABLE TYPE

Fig. 3—Detachable wear-strip drills are designed for drive by Pratt & Whitney drill bars

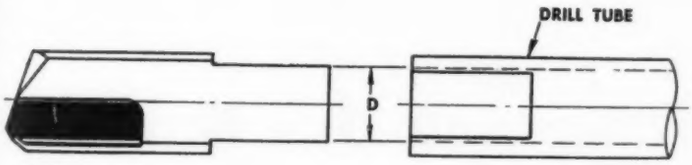

FIG. 4

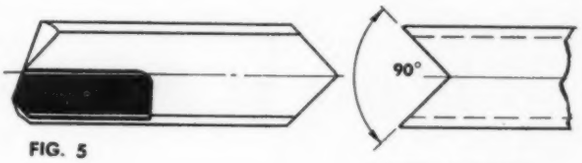

FIG. 5

METHODS OF ATTACHMENT

Fig. 4—One satisfactory method of brazing the drill end to the drill tube consists of turning down the shank to fit inside the drill tube. Fig. 5—Another method consists of milling the drill end to tongue shape and notching the end of the tube. Fig. 6—Detachable drill ends fit a socket in driving bar, are driven by keys

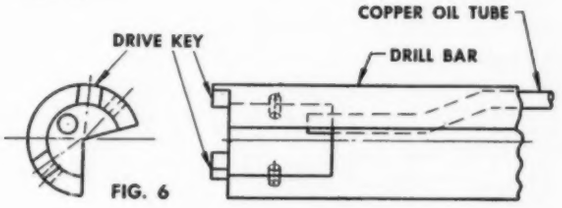

FIG. 6

of the tool should always be on center to 0.003 in. below center to produce a free cutting action.

Drill Grinding

Successful operation of any all-depth carbide drill depends on use and maintenance of correct cutting and relief angles, Fig. 7. All grinding should be done freehand. To rough grind the 42° outer cutting angle, hold the drill firmly in a V-block swung at that angle, and with the table tilted 12° to 15°. During this operation, rotate the drill about its own axis to produce the 12° to 15° eccentric clearance angle, as when grinding the end of any drill.

To rough grind the 20° inner cutting angle, hold the drill in a V-block swung at a 20° angle and with the table tilted at the 12° to 15° clearance angle. Keep the cutting-tip face parallel to the grinder table. A simple fixture can be developed for this work. Locate the drill point at a distance equal to 0.193 times the drill diameter away from the outside diameter of the drill. Use a 60-grit silicon-carbide cup wheel for rough grinding operations.

Finish grinding of both the 42° and 20° angles at an 8° relief angle may be done in the same or similar fixtures. In this case the table is tilted 8°. The land below the cutting edge should be about 1/32 in.

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You may think it strange that millions of people could have a voice in changing a company's name, but that is what has happened to The American Rolling Mill Company.

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Through the years—as the original small mill grew into one of the country's great steel companies—our customers, dealers and the public alike have preferred to call the company "ARMCO." So, in recognition of this preference, the name of the company has been changed from The American Rolling Mill Company to Armco Steel Corporation.

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CARBIDE DRILLS—III

wide. To secure a keen cutting edge, finish grinding is preferably done with a 100- to 150-grit diamond cup wheel. Lapping the cutting edge with a 220- or 240-grit diamond wheel improves drilling operation on some jobs.

The steel drill body above the cutting edge and behind the drill flute should be cut away at a 30° angle. This aids the flow of cutting fluid into the drill flute.

Sharpening should be done only on the end of the drill. The face of the cutting tip should never be touched.

Best results with all-depth carbide drills have so far been obtained on regular gun drilling machines, because these are designed for the use of stationary drills. Ordinarily, drills of the type considered here cannot be rotated at the speeds proper for carbide, because long drills of unsymmetrical shape tend to result in an unbalanced condition. Possibly, short drills can be rotated, and in this case the cutting angles would be comparable to those used for stationary drills, but the chips would be carried out through center instead of an external flute.

Practically all of the gun drill work done to date has been carried out in the feed range of 0.0006 to 0.0036 in. per revolution, the lighter feeds being used for the smaller drills. But feed rate depends on oil pressure and size of oil hole through the drill. The oil pressure should always be high enough to keep the chips flowing continuously away from the cut. Depending on the job, the oil pressure will range between 300 and 800 psi. Experience indicates that the oil-pump motor must have a capacity equal to or larger than the drilling-machine drive motor.

Full advantage of carbide drills can not be realized when the equipment lacks sufficient speed. The correct cutting speed for the job will lie between 130 and 350 sfpm., when drilling steel. Start a new job at 200 to 250 sfpm., and vary the speed in either direction until

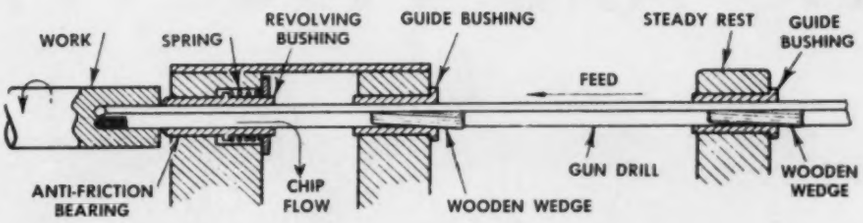


FIG. 8

Fig. 8 (Above)—The use of a combination guide bushing and steady rest will insure that the drill starts correctly and operates without excessive vibration. The wooden wedges should be kept tight

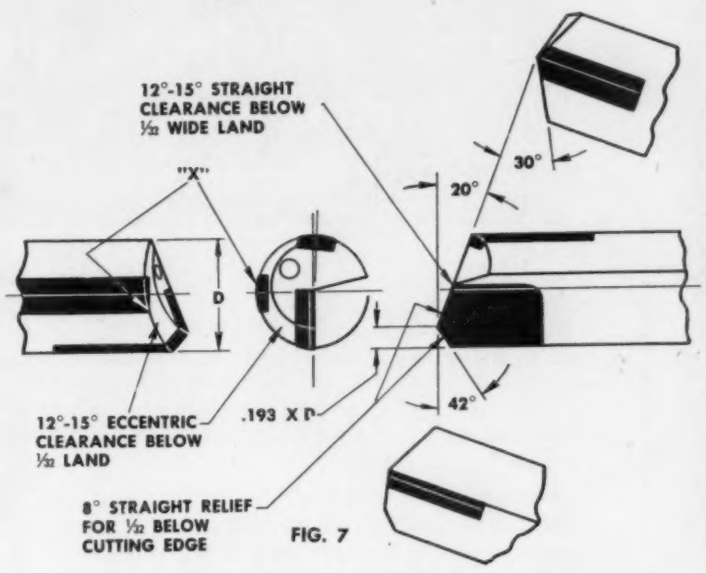


FIG. 7

Fig. 7 — (Right)—Cutting and relief angles for all-depth drills may be ground in simple fixtures. Finish grinding should be done with a diamond wheel

a satisfactory balance is achieved between drill life and feed rate.

Usual tendency of an all-depth drill is to follow the direction in which it is started. Therefore, one of the most important parts of the setup is the drill guide in the combination drill guide and work support, Fig. 8. As shown, the revolving guide bushing is forced against the work by spring pressure and helps to get the drill started properly. Triangular wooden wedges are driven into the stationary guide bushings to dampen drill vibration.

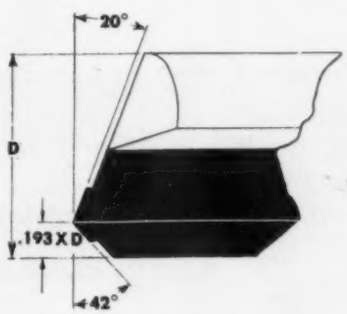


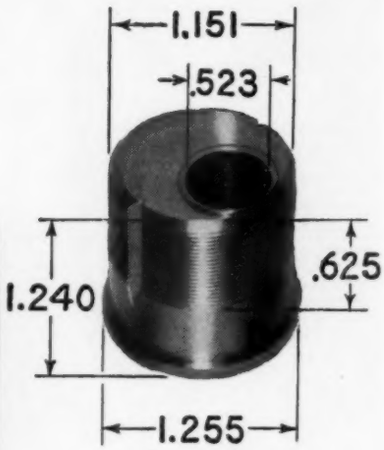
FIG. 9

Fig. 9—Steps ground in the cutting edges of large drills will break up the chips

When all-depth drills approach 2½ in. in diameter, it is necessary to break the broad chip, which comes from the 20° and 42° cutting angles. Steps ground in the cutting edges, as in Fig. 9, will effectively break up the chips.

If the cylindrical land along the cutting edge shows signs of rapid wear, excessive pressure so denoted can be relieved by increasing the distance from the periphery to the drill point by a slight amount. If the wear strip located 183° behind the cutting edge shows excessive wear, a slight decrease in the distance from the periphery to the drill point will remedy the condition.

NEW BRITAIN AUTOMATICS LOWER BREAK-EVEN POINT ON THIS PIECE...



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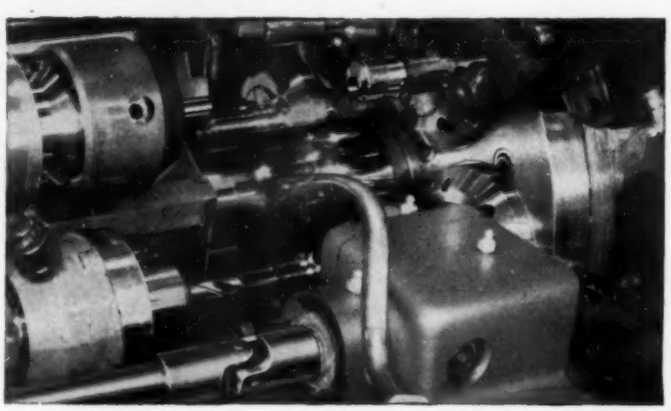

A leading manufacturer formerly turned out the lock cylinder case illustrated from castings on five separate machines, each of which required a full time operator. Searching for more profitable production, he decided to investigate the possibility of automatic machinery.

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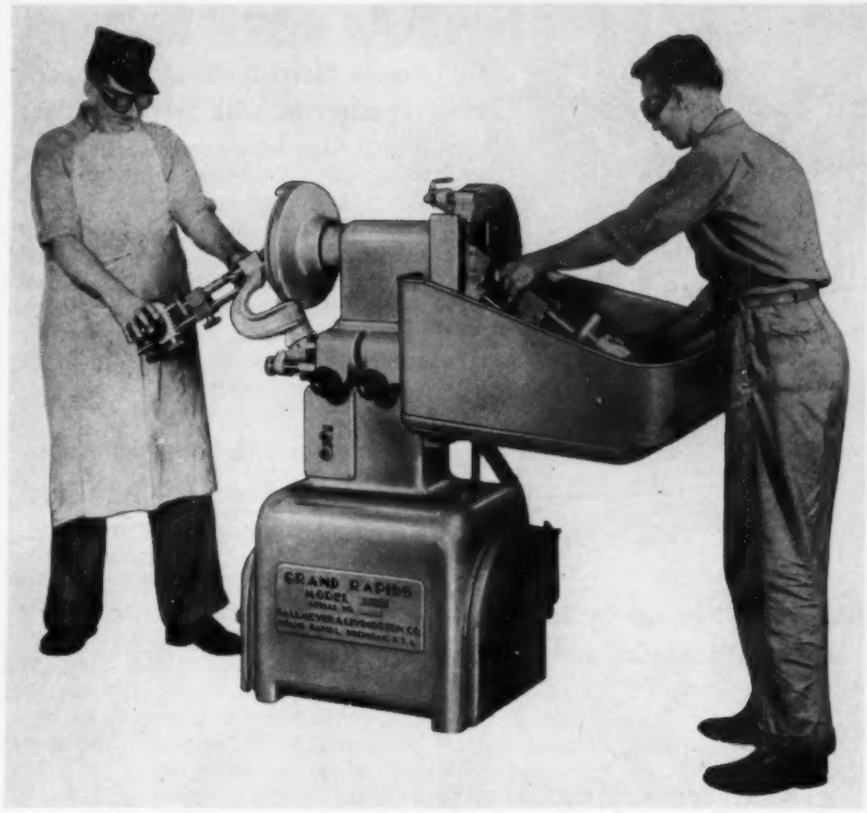


A large drill and a small drill being sharpened simultaneously on the CWA drill grinder

Grand Rapids Drill Grinder No. CWA Designed to Sharpen Twist Drills

The Model CWA double-holder twist-drill grinding machine made by the Gallmeyer & Livingston Co., Grand Rapids, Mich., is designed to sharpen standard 2-, 3-, and 4-flute drills of either straight-shank or taper-shank type at the standard 59° angle. Machine has a capacity for sharpening twist drills from No. 52 to 2½ in. Small drills are ground dry on one side of the machine, while large drills are ground wet on the other.

Machine is equipped with an accurately machined spindle, running in double-row precision ball bearings, said to be capable of resisting heavy combined radial and thrust loads from any direction and in any combination. The bearings are grease-packed and have built-in shields for retention of lubrication and exclusion of dirt.

When changing from the sharpening of a small 2-flute drill to the grinding of a 3-flute drill of a larger diameter, the only adjustment necessary is to slide the tailstock so that it compensates for the difference in length.

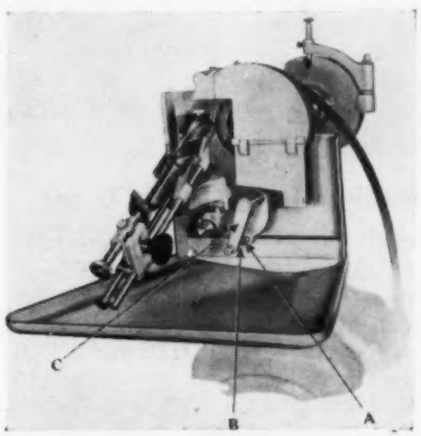
Drill holders embody a rectangular lip rest which supports the lip of the drill. Lip rest is reversible from side to side or from top to bottom when it becomes worn after sharpening hundreds of drills.

A diamond truing device for dressing the face of the grinding wheel makes it possible to automatically maintain proper relationship between the holder and the face of the grinding wheel. As the diamond is fed into the wheel for dressing, holder is automatically moved in to compensate for the amount removed from the face of the wheel.

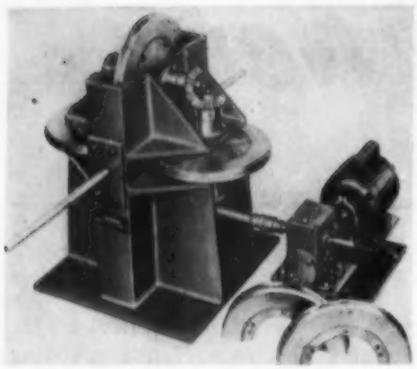
The machine is equipped with 12-in. dia. grinding wheels and with 1½-hp. ball-bearing motor for spindle drive. The V-belt drive makes it possible to operate at the right spindle speed regardless of 25-, 30-, 50- or 60-cycle current.

The coolant tank is divided into two compartments, removable for cleaning. Motor is mounted on an adjustable bracket for adjustment of belt tension.

Proper clearance behind the drill cutting edge is assured because the relationship of the front of the lip rest to the drillholder, and its relation to the axis of oscillation, are such that the outside edge of the drill cutting lip will be in advance of the edge near the center of the drill. Therefore portions of cutting lip near the center are ground with a greater angle than those nearer the periphery.

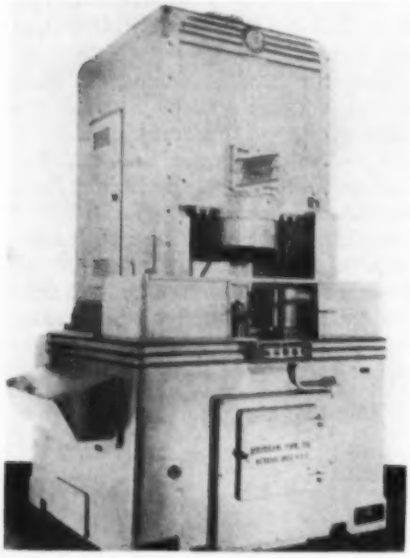


The gage pin, A, is positioned so that the lip-rest blade is in correct relationship with the face of the grinding wheel. Diamond is at point B, and is carried in arm C, which swings it across the face of the wheel



Seamless, Light-Wall Tubing Stamped by Automatic Marker

The Master Marker is offered by Pannier Bros. Stamp Co., Pannier Bldg., Pittsburgh 12, Pa., for stamping seamless and light-wall tubing. The marking machine stamps 1, 2, 3, or 4 sides on the same run at a rate up to 300 fpm. It also handles bars in round, square, hexagon, and other shapes and in sizes from ⅜- to 2-in. dia. Machine is equipped with a 1/3-hp. motor. Character size depends on requirements of the product in question.



Michigan Tool's External Shaper Cuts All Gear Teeth At One Time

A Shear-Speed external shaper, Model 18103, capable of cutting gears, toothed clutches and other external shapes up to 10-in. O.D. and 2¾-in. thickness has been developed by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Over-all dimensions are 86½x 78½x123 in. Shaper is powered by a 30-hp. electric motor and has a maximum stroke of 3 in. Machine cuts all teeth in a gear simultaneously and is recommended for gear or involute splines from 5 pitch to 12 pitch. The head is automatically locked in cutting position.

Air Impact Hammer by Bryant For Light Stamping and Forging

An air-impact hammer is offered by Bryant Products Distributing Co., 297 W. Michigan Ave., Jackson, Mich. The development of "exploded air" is said to make possible the production of one-ounce to 12,000-lb. impact with 100-lb. line pressure in this bench-type production hammer. Air under high compression is equalized on both sides of the piston. The air below the piston is then exhausted suddenly.

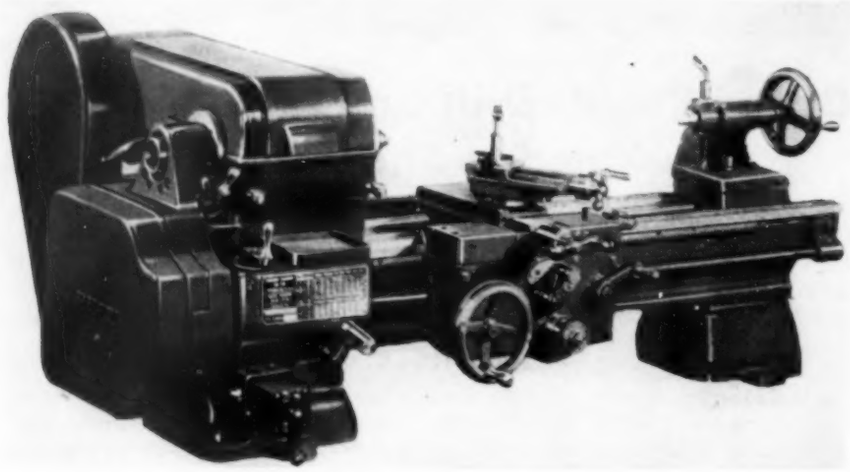
Hammer is used for light stamping and forging, trimming, molding, riveting and forming various materials, and is said to do production work up to ¼-in. mild-steel rivets.

Ampco Aluminum-Bronze Scraper Constructed with Serrated Edges

A self-sharpening floor scraper, made by Ampco Metal, Inc., Milwaukee 4, Wis., is constructed of corrosion-resistant non-sparking aluminum bronze with serrated edges designed so that the scraping edge is flat against the floor or scraping surface. Serrations impart a self-sharpening action to the tool. Scraper is 8 in. wide, and weighs 1¼ lb.

Storage Bin with 4-Way Entrance For Hand, Power-Lift, Fork Truck

An all-steel storage bin is marketed by Palmer-Shile Co., 10019 Fullerton Ave., Detroit 27, Mich. Designed with a 4-way entrance for use with a hand, power-lift or fork truck, it can be tiered with a portable elevator, high lift or fork truck. Bin can be built with crane lugs for use with an overhead hoist. Inside dimensions are 36x36x24 in.



10-IN. BENCH LATHE with a 1 1/16-in. hole through the spindle and an integral horizontal motor drive is offered by Sheldon Machine Co., 4258 N. Knox Ave., Chicago 41, Ill. Lathe features a ¾-in. collet capacity (1-in. collet capacity with nose-type collet chuck), double-walled worm-feed apron with power cross feed, and a quick-change gear box that gives a thread-cutting range of from 4 to 224 threads per in. The 4-step, V-belt motor drive takes either a 1/3- or ½-hp. motor

INDIANA GEAR WORKS

South Wind DIVISION STEWART WARNER CORP.

THE SYMBOL OF QUALITY LB LINK-BELT

FAMOUS MANUFACTURERS use LODGE & SHIPLEY Lathes

Century

SCHUTTE & KOERTING PHILADELPHIA PA

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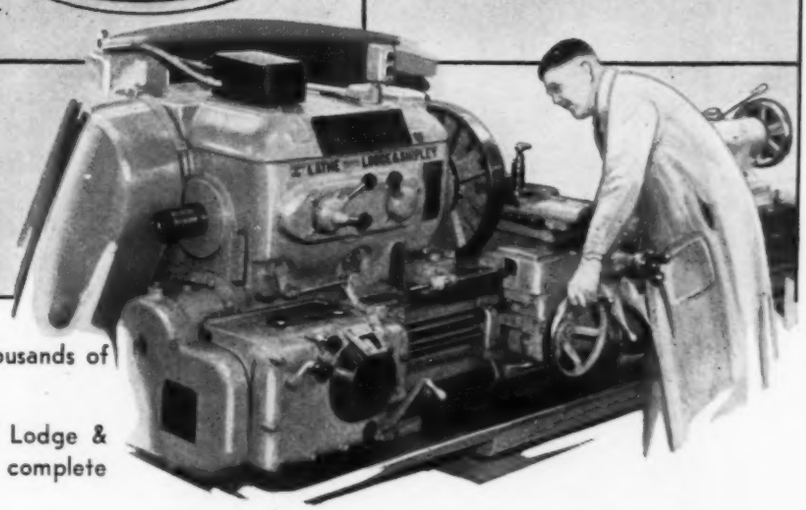
S. G. TAYLOR CHAIN CO. HAMMOND, INDIANA



• These names represent but a few of the thousands of satisfied users of Lodge & Shipley Lathes.

In a continuing survey of the performance of Lodge & Shipley Lathes, plants large and small report complete satisfaction:

"A very good lathe" "The finest lathe we have ever used" "Production up 300%" "Time saved, 65%" "Accurate to extremely close limits."

Lodge & Shipley Engineers will gladly show you the amazing facts discovered in this survey, demonstrate on your own work how Lodge & Shipley Lathes can do your work faster, better and at lower cost. Write for Condensed Catalog.

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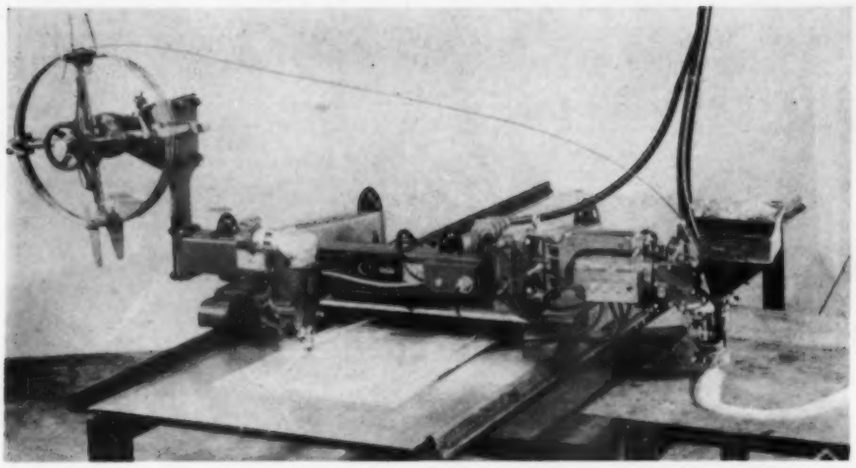
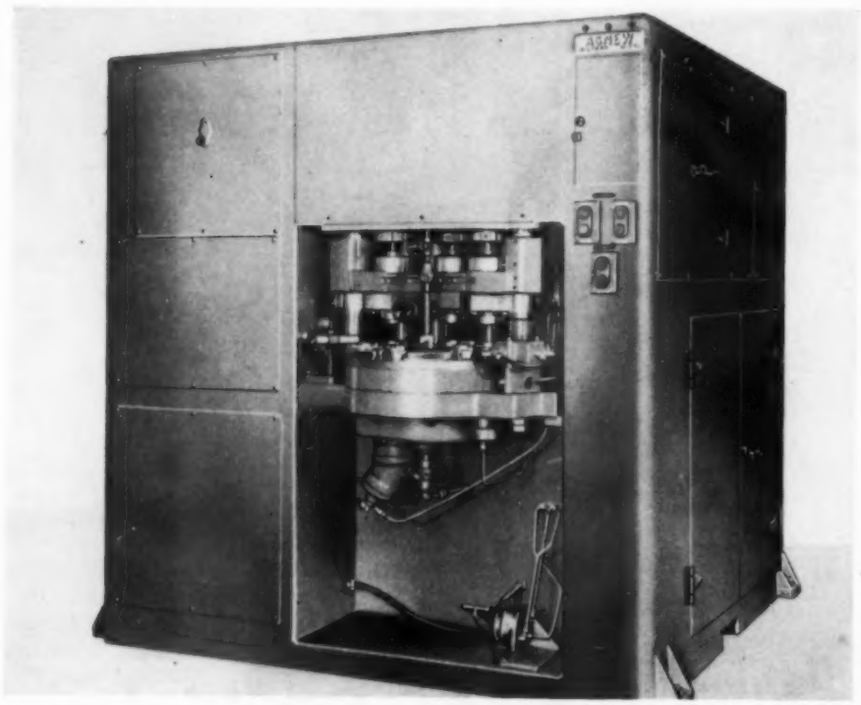


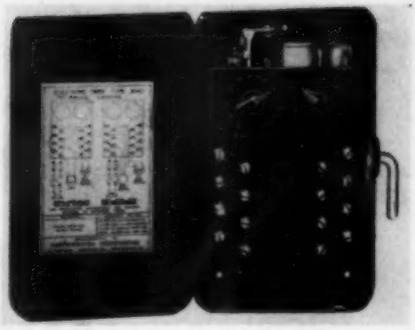
Unionmelt Shape-Welding Machine For Making Welds to Any Outline

A machine for making welds to any outline by its submerged-melt welding process is marketed by The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y. Any desired outline can be followed by the use of a strip templet.

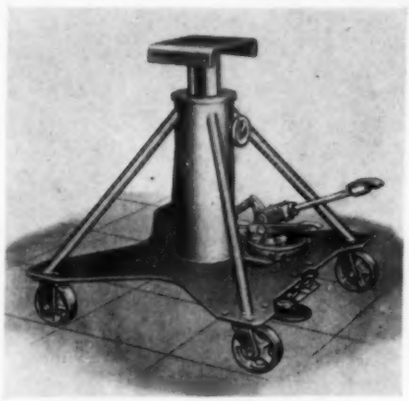
The Type U welding head has a maximum current capacity of 2000 amp. and can weld in a single pass material from 18-gage to 1¼-in. plate. Machine will operate over an area 34x80 in. Sections can be added to the tracing table so that any length can be covered. Welding speed is adjusted by a stepless speed control on the tracing machine. Speeds are possible from 4 to 40, or 11 to 100 ipm.



ASSEMBLING of one-piece spark plugs is possible on a special hydraulic machine offered by Agnew Electric Co., Milford, Mich. Listed as type HCP3-5, machine can be adapted to progressive welding and forming operations. All sequencing operations are performed hydraulically. Table has six stations which index 60°. Pressures up to 8 tons are available. When pedal is released all three rams return to their original position and machine stops



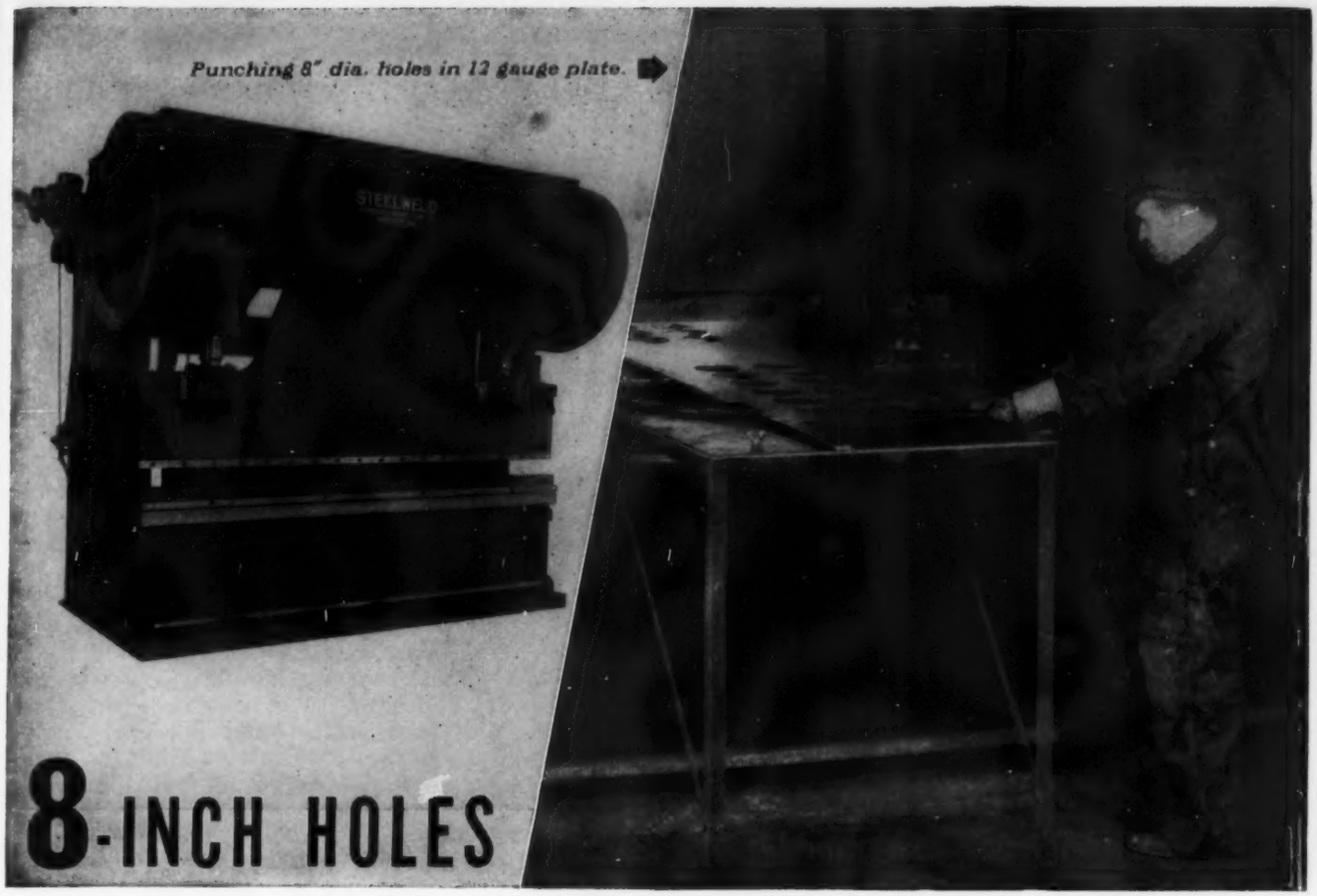
ELECTRONIC timer series 30 for machinery and process control is offered by Photoswitch Inc., 77 Broadway, Cambridge 42, Mass. Unit has a range of from 0.03 sec. to 4 min. and is recommended for control of hydraulic presses, spot welders, and similar equipment. Circuit is self-compensating for changes in line voltage



ELEVATING TABLE, hydraulically operated, and without the regular top is offered by Lyon-Raymond Corp., 4808 Madison St., Greene, N. Y., for special applications requiring an adjustable pedestal capable of handling 2000-lb. loads. An 8x10-in. bracket is furnished for mounting special tools and fixtures. Platform elevates from 28 to 44 in., and can be locked in position or allowed to revolve freely

Gage for Form, Hole Sizes Measures by Direct Reading

A gage for checking form and hole sizes in tool, die and machine work utilizes telescoping and flush pin-gage principles. Made by Penjaska Tool Co., Owosso, Mich., gage measures openings of angles, radii, internal tapers and similar work. A 2- to 3-in. micrometer gives direct readings. Gage eliminates necessity of removing work from the machine. Range varies from 0.160 to 0.760 and measures all degrees of forms from 19°. Model sells at $12.50.



8-INCH HOLES *with a* BENDING PRESS

There are other ways to make large holes in steel plate but many Steelweld owners find their press handles this work easily and speedily. Best of all, when the job is done the dies can be changed quickly and the machine set up to make sharp bends, smooth curves, corrugate or other forming operations.

In most shops Steelwelds are never idle. They are NOT one-purpose machines. When one job is completed, there is always another ahead for Steelwelds. They are versatile tools easily adapted to practically every plate-forming operation.

Steelwelds are not only "Jack of all" metal-forming jobs, but they are "master" of them as well, for they are accurate, efficient and easy to operate.

Get the facts on Steelwelds. See what they can do for you.

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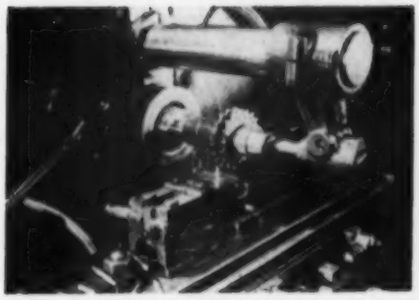
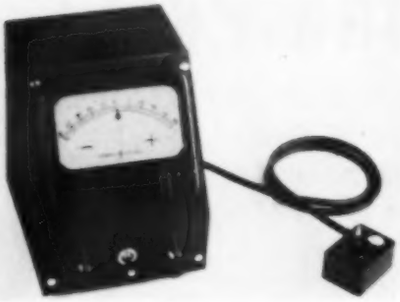
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



Mueller's Self-Centering Device For Manual, Automatic Operation

A self-centering device is featured on the universal part holder offered by Mueller Industries, Dept. 8, 4755 N. Rockwell St., Chicago 25, Ill. The part holder can be used on milling, drilling, assembling, threading, and similar operations. Device can be operated by manual, automatic, pneumatic, or mechanical means.

The clamp jaws have a 3/16-in. maximum opening, which will allow a workpiece to be gripped behind a shoulder. Model will accommodate work up to 1 in., round or hex, or odd-shaped pieces within that range. Part holder allows for chip clearance and coolant entry.



Electric Micrometer for Gaging, Also Measuring, and Telemetering

Stevens-Arnold Inc., 22 Elkins St., South Boston 27, Mass., announces an electric micrometer for measuring and gaging operations which is suitable for telemetering where remote indication of small movements is desired.

Transmitter is a sealed unit having a projecting plunger which will accept motions of ±0.010 in. from the center position, or 0.020 in. total in one direction. Mechanical motion is translated into changes in electrical energy which are sent to the control unit. Control unit has a zero center indicating instrument and can be read to 0.00025 in. on a 4-in. scale. Controls consist of one adjustment on the transmitter, and two on the control unit.

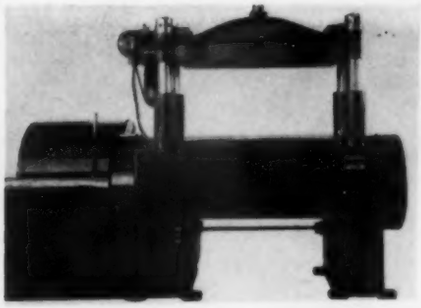
Direct-Reading Tachometer Shows Revolutions per Min.

A Chronometric tachometer which shows per minute speeds, rpm., and fpm., in 3 sec., (Type A) and 6 sec., (Type B), is offered by O. Zernickow Co., 15 Park Row, New York 7, N. Y. Timing is automatic with no stop watch needed. Pushbutton operation allows speeds to be read at leisure. The range of Type A is 0 to 20,000 rpm., and 0 to 10,000 fpm. Range for Type B is 0 to 2000 rpm. and 0 to 1000 fpm.

Also announced is an improved tachoscope with a precision counter synchronized with a Swiss stop watch. Tachoscope can be used as a speed indicator, calibration check for tachometers, and stop watch. A trigger starting and stopping mechanism controls both the counter and watch simultaneously.

Univis Plastic Safety Goggle Resists Surface Scratchings

The Safe-T-Vis safety goggle is offered by Univis Lens Co., Dayton 1, Ohio. Made of an allyl casting resin the plastic is said to incorporate lightness, comfort and the safety features of plastics as well as to resist surface scratchings. A Safe-T-Vis lens is said to be approximately one-half the weight of a case-hardened glass lens. Lenses are available in four goggle styles and in a selection of sizes.



Alpha Tool's Die-Tryout Press Operates at 60 Strokes per Min.

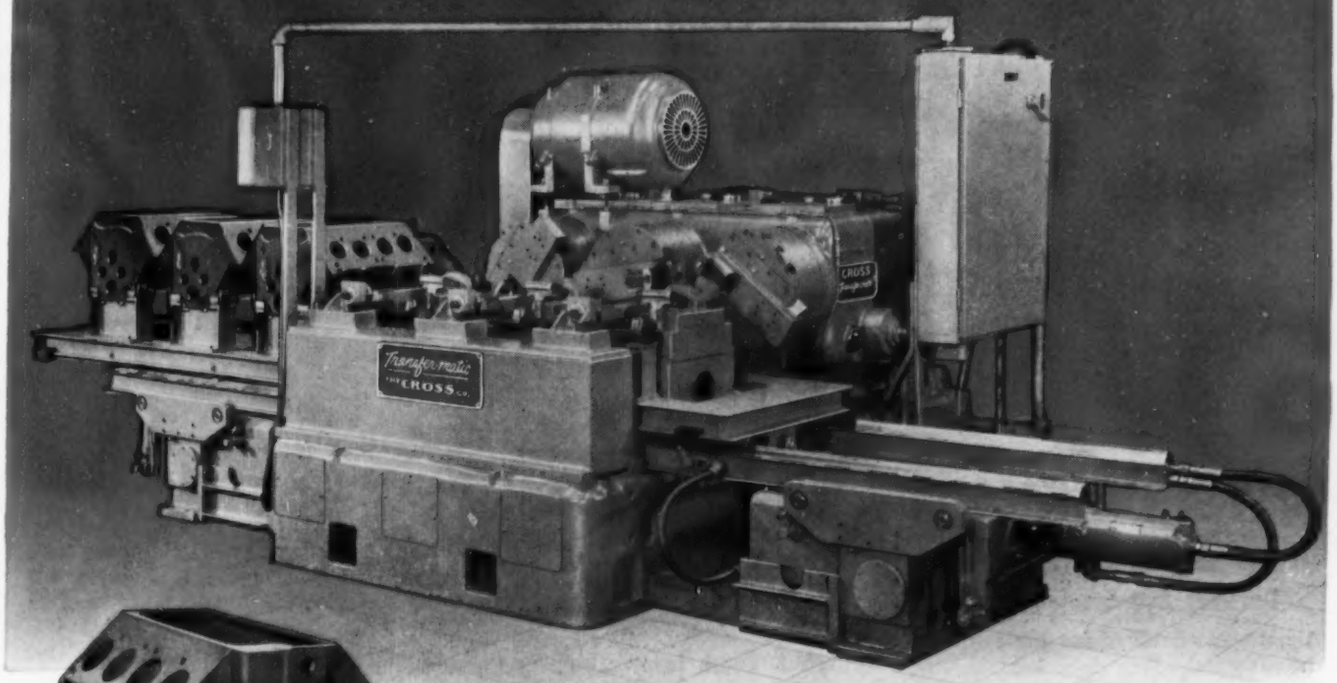
A 100-ton production-type die-tryout press which operates at 60 strokes per min., is introduced by Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich. The head lifts out of position by electric control and inverts so that both members of the die are accessible for finishing work without removing die from the press. Head turns electrically to its original position after finishing. Press has a 6-in. stroke, a maximum shut height of 16 in., and a minimum shut height of 12 in.

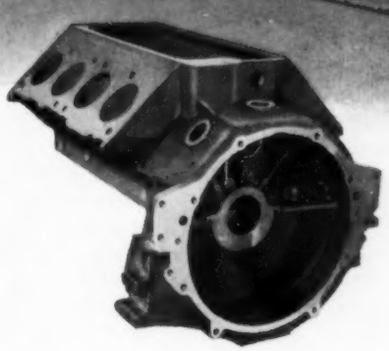
Single-Blade Expansion Reamer Reams An Exact-Diameter Hole

The U. S. Reamer & Tool Corp., 124 S. Isabel, Glendale 5, Calif., introduces a single-blade expansion reamer for reaming exact-diameter holes to fit almost any size of soft metal bearings. Each size is supplied with standard-, and oversizering gages. When bearing has been reamed to proper size, the ring gage is said to prevent further expansion.

Reamers have a tungsten-carbide blade, and are made in 32 standard sizes from 11/16 to 3⅝ in. Blade is said to produce an accurate ream-finish.

Another Transfer-matic by Cross





Solved—

Accuracy, Production and Cost of Facing Cylinder Block Assemblies

A large motor car company wanted greater accuracy in machining cylinder block assemblies—without sacrificing production or increasing costs. They consulted Cross . . . this specially designed Transfer-matic—which meets every requirement—is the result.

Squareness with the crankshaft bore and flatness of the machined surface do not exceed .0015 total indicator reading. Net production of 45 pieces per hour is achieved with one, less-skilled operator. The transfer mechanism handles parts in multiples to conserve manpower. Costs are actually reduced.

This Transfer-matic can be expanded to include additional machines for other operations such as precision-boring the locating holes for the transmission, or finish-facing the crankshaft thrust faces. The transfer mechanism is then lengthened by adding standard units to accommodate the change.

PART: Cylinder Block and Clutch Housing Assembly.

OPERATION: Finish transmission joint face square with crankshaft bore.

PRODUCTION: 45 pieces per hour at 80% efficiency.

EQUIPMENT: Cross Special Three-Spindle Transfer-matic.

FEATURES: ☆ Automatic power transfer mechanism for loading and unloading ☆ Parts slide in and out of machine on conveyor . . . no lifting is required ☆ Increased production per man hour by facing three cylinder blocks at the same time ☆ Single point carbide facing tools assure accuracy, reduce heat at cutting point, and do not set up unnecessary strains ☆ Automatic power locating and clamping ☆ Hydraulic power feed and rapid traverse for the rotating facing slides ☆ Gasket mounted hydraulic valves conveniently located for ease of maintenance.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

THE CROSS COMPANY

Established 1898

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

Munton High-Speed Air Press Delivers 200 Strokes per Min.

A high-speed air press for riveting, drawing light materials, forming and operations on products requiring light, fast work, is offered by Munton Mfg. Co., Franklin Park, Ill. Presses are available in capacities of ½, 1, and 2 tons at 80-lb. air-line pressure. Two-way cylinders have cushioned top and bottom, and ram guide manually operated by a hand lever. Available attachments include a silencer and speed regulator.

Rusnok Milling Attachment Includes Rail-Type Mounting

A rail-type mounting is offered by Rusnok Tool Works, 4840 W. North Ave., Chicago 39, Ill., for their milling attachment. Milling attachment can be placed and locked in position within a full 180° adjustment. Brackets are fitted to milling machines with round overarm within the range of 3 to 5 in. in diameter. Milling attachment mounted with this bracket can be operated on either side of, or directly in front of the overarm.

Bausch & Lomb Interferometer Measures Flatness of Surfaces

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y., offers an interferometer for measuring flatness of surfaces. The instrument can be used at various room temperatures. The precision device sets up shadow-like bands of interference in light reflected between its master optical flat, which has a surface accuracy of one millionth of an inch, and the object being tested.

The instrument's master optical flat is never brought in contact with the object under inspection, eliminating the possibility of distortion. Surfaces with as much as a 4-in. recess can be viewed. Field of view of the large model Williams Plano interferometer is 4¼ in. in diameter. The smaller size instrument (illustrated) has a 1⅞-in. capacity.

Electro Arc Boring Machine Disintegrates Broken Drills

A boring machine which disintegrates broken taps, drills, end mills, reamers, and similar work without changing the temper of the metal is offered by Electro Arc Mfg. Co., 5930 Commonwealth Ave., Detroit, Mich. Boring machine cuts hole from 0.040 to 1 in. and up in diameter, and in round, square, hexagonal, U- and bar shapes. Machine is said to cut any size or shape hole in any steel or metal including carbides.

Microdrill for Small Holes Utilizes Electronic Circuits

Teletronics Laboratory, 352 Maple Ave., Westbury, N. Y., announces a precision instrument for rapid drilling of accurate small holes, called the Microdrill. The surface of the work is located and the depth of the hole held to close tolerances by means of a thermal-motor feed and automatic electronic-control circuits.

Drill can be lowered to work and held automatically in correct position at its surface without visual observation by turning a knob. Drill will automatically stop feeding and hold at the pre-determined hole depth. Lamps indicate "at surface" and "at depth" positions of the drill. A dial gage measures vertical displacement.

The standard model has a collet for 0.004- to 0.025-in. pivot drills and a maximum recommended electronic-feed travel of 0.150 in. A variable electric drive provides a maximum spindle speed of approximately 50,000 rpm.

SKID made of steel and having end racks is offered by Palmer-Shile Co., 16019 Fullerton Ave., Detroit 27, Mich. Designed for handling heavy loads, skid is equipped with removable end racks to facilitate loading and unloading. Model can be used in handling hot metal parts and can be built with a ventilated bottom

Why "M-11" produces

MORE TAPPED HOLES PER TAP

M-11 is a chrome-cobalt high speed steel used exclusively by Detroit Tap and Tool Company for taps, thread gages and thread milling cutters. Some of the reasons for its use are:

COBALT . . . **Takes the human element out of hardening. THIS MEANS THAT UNIFORM HEAT-TREAT CAN BE OBTAINED AUTOMATICALLY!**

Increases the red hardness over ordinary HSS. THIS MEANS M-11 TAPS ARE HARDER, TOUGHER AT OPERATING TEMPERATURES.

CHROMIUM . **Increases toughness and strength of steel after heat treatment. THIS MEANS LESS BREAKAGE.**

Causes hardness to penetrate deeper and more uniformly. THIS MEANS SAME QUALITY AFTER AS BEFORE SHARPENING.

Resists corrosion. PROTECTS TOOLS IN TOOL ROOM. ALLOWS GREATER LATITUDE IN COOLANTS.

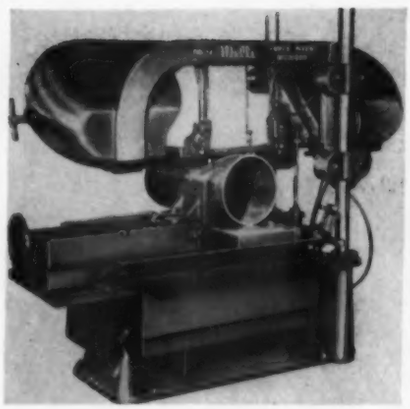
Provides greater resistance to abrasion. THIS MEANS MORE PIECES PER SHARPENING, MORE THREADS PER TAP.

This combination of chromium and cobalt in Detroit Tap's M-11 high-speed steel is available to you at no increase in cost over quality taps made of ordinary high-speed steels. And back of every M-11 tap, thread gage and thread milling cutter is Detroit's SERVICE — a service which can make the proud claim:

WE'VE NEVER "SHUT DOWN" A LINE YET!!

The Home of
"M-11" CHROME-COBALT HSS TAPS, THREAD MILLING CUTTERS & THREAD GAGES

DETROIT
TAP & TOOL CO.
8432 BUTLER STREET • DETROIT 11, U. S. A.



Heavy-Duty Band Saw by Wells Embodies Wet-Cutting System

The No. 12 heavy-duty metal cutting band saw with automatic cutting cycle and electrically controlled blade pressure is available with a complete, self-contained wet-cutting system. Made by the Wells Mfg. Corp., Three Rivers, Mich., the system is installed as an integral part of the saw and includes a chip pan, fluid tank, centrifugal-type pump-motor unit, splash guards, and protective screens. Working capacity of the system is three gallons of fluid.

GRANITE precision surface plate, 8x16 ft., and finished to a tolerance of 0.002 in., is made by The Herman Stone Co., 324 Harries Bldg., Dayton 2, Ohio. Surface plate weighs approximately 25 tons and can be used for checking stampings as long as 144 in. Its non-warping qualities eliminate necessity of periodic checking

CONVEYORS, called Flex-E-Unit steel-belt conveyors, are made by Sermat Conveyor Corp., 2350 W. 58th St., Chicago 26, Ill. Conveyor is composed of a head, or drive section and take-up section at opposite end. Each section is 5 ft. long. Basic arrangement can be lengthened to 175 ft. Combinations of 4- or 5-ft. sections accomplish desired length. Widths are offered in 4 sizes from 12 to 36 in.

Automatic Buffing Machine Buffs Cylindrical Objects

An automatic buffing machine designed to buff cylindrical objects from fountain-pen to eight-quart-pan size is said to be capable of treating from 120 to 2000 pieces per hr. Designed by Square Deal Machine Co., South Gate, Calif., for Western Die Casting Co., Emeryville, Calif., eight collets are mounted on the table, two for loading and unloading and six for the buffing operation. Six buffing heads are separately controlled and driven by individual GE Tri-Clad motors. Spring-loaded flexible buffing heads with hydraulic stabilizers eliminate necessity for continual adjustment of heads to compensate for wheel wear.

Call Your Steel Distributor

FOR COLD FINISHED BAR STEEL

J&L STEEL

Typical distributor's stock of cold finished bar steel

for Quick Service *from* Well-Assorted Stocks *of* High Quality Cold Finished Steel

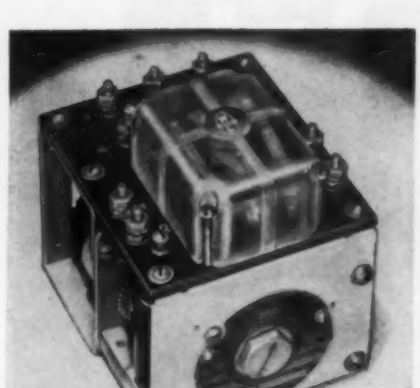
When you need cold finished bar steel —and need it in a hurry—call your steel distributor.

He maintains complete stocks of cold finished bar steel in a wide variety of sizes and grades. He is conveniently located. He is equipped to make quick deliveries to meet both your normal and your emergency requirements.

J&L cold finished steel, in sizes, shapes and grades to meet your requirements, is available through leading steel distributors throughout the United States.

For the name of the steel distributor nearest you who stocks J&L Cold Finished Steel write to Room 402, Jones & Laughlin Building, Pittsburgh 30, Pa.

JONES & LAUGHLIN STEEL CORPORATION



Ward Leonard Time-Delay Relay Allows Sequential Operation

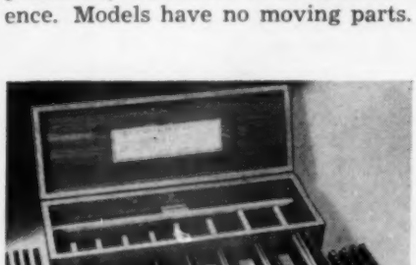
A motor-driven time-delay relay with composite connections, Model 362, is marketed by Ward Leonard Electric Co., Mount Vernon, N. Y. Relay is designed for use in control equipment or systems where an adjustable time delay, after closing the pilot circuit, is required for proper remote, automatic or sequential operation.

Two different timing sequences can be obtained. With one set of connections "delayed make" with a maintained pilot circuit is provided. The other set of connections permits "instantaneous make" and "delayed break" with a momentary-contact pilot circuit. Timing is adjustable over a timing range to 63 min. max.

Heavy-Duty ac. Arc Welders Offer High-Frequency Circuits

Two hi-cycle ac. arc welders for heavy-duty industrial use are introduced by Mid-States Equipment Corp., 2429 S. Michigan Ave., Chicago 16, Ill. Models, with 200- and 300-amp. output, respectively, feature a precision electrical circuit which holds the welding arc constant with selective heat settings in 1-amp. steps through a special air-cooled induction-type transformer.

The circuit features remote control at the electrode holder for electronic fluxing and oxide-dispersal requirements of the arc processes such as inert gas-shielded arc welding. The high-frequency circuit is said to practically eliminate radio interference. Models have no moving parts.



Carbon, High-Speed Steel Broaches In Du Mont Keyway Broach Kit

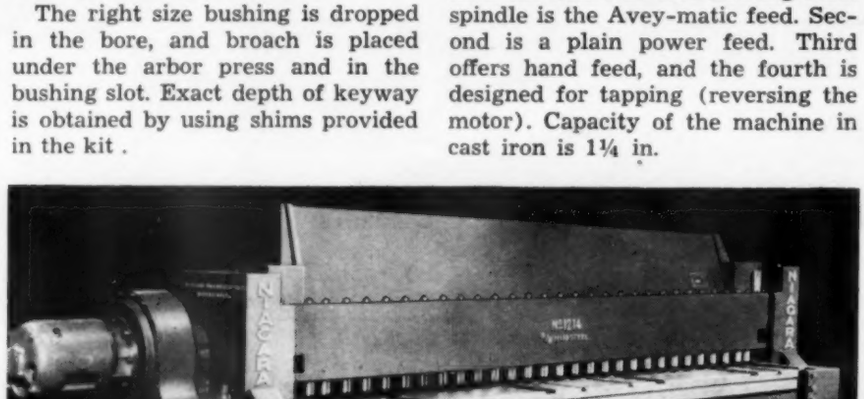
Additions to Minute Man keyway broach kit are made by du Mont Corp., Greenfield, Mass., for cutting standard keyway sizes approved by the A.S.A. Kits are available with carbon-steel broaches and with high-speed steel broaches. Bushings are provided for all hole sizes from ½ to 1 9/16 in. by sixteenths.

The right size bushing is dropped in the bore, and broach is placed under the arbor press and in the bushing slot. Exact depth of keyway is obtained by using shims provided in the kit .

Speed Change on Drilling Machine Accomplished by Gear-Shift Setup

Speed changes are made through selective and sliding gears on the Avey BMA-6 drilling machine announced by The Avey Drilling Machine Co., Cincinnati, Ohio. Machine offers six speed changes and features a gear shift similar to that used in shifting an automobile. Setup is controlled by a single lever at the front of the machine. Each spindle is individually driven by a constant-speed motor. A V-belt is used on the final drive from gear box to spindle.

Model illustrated is a four-spindle machine with a 12-in. overhang. First spindle is the Avey-matic feed. Second is a plain power feed. Third offers hand feed, and the fourth is designed for tapping (reversing the motor). Capacity of the machine in cast iron is 1¼ in.



HEAVY-DUTY underneath-drive squaring shear is offered by Niagara Machine & Tool Works, Buffalo 11, N. Y. Machine's rated capacity is ⅝ in. in mild steel, 14 ft. long, and called No. 1214. The holddown, driven by eccentrics on the crankshaft, needs no auxiliary operating mechanism. The triangular box-section crosshead gives rigid support to the knives. The self-measuring back gage can be arranged for either manual or electric operation

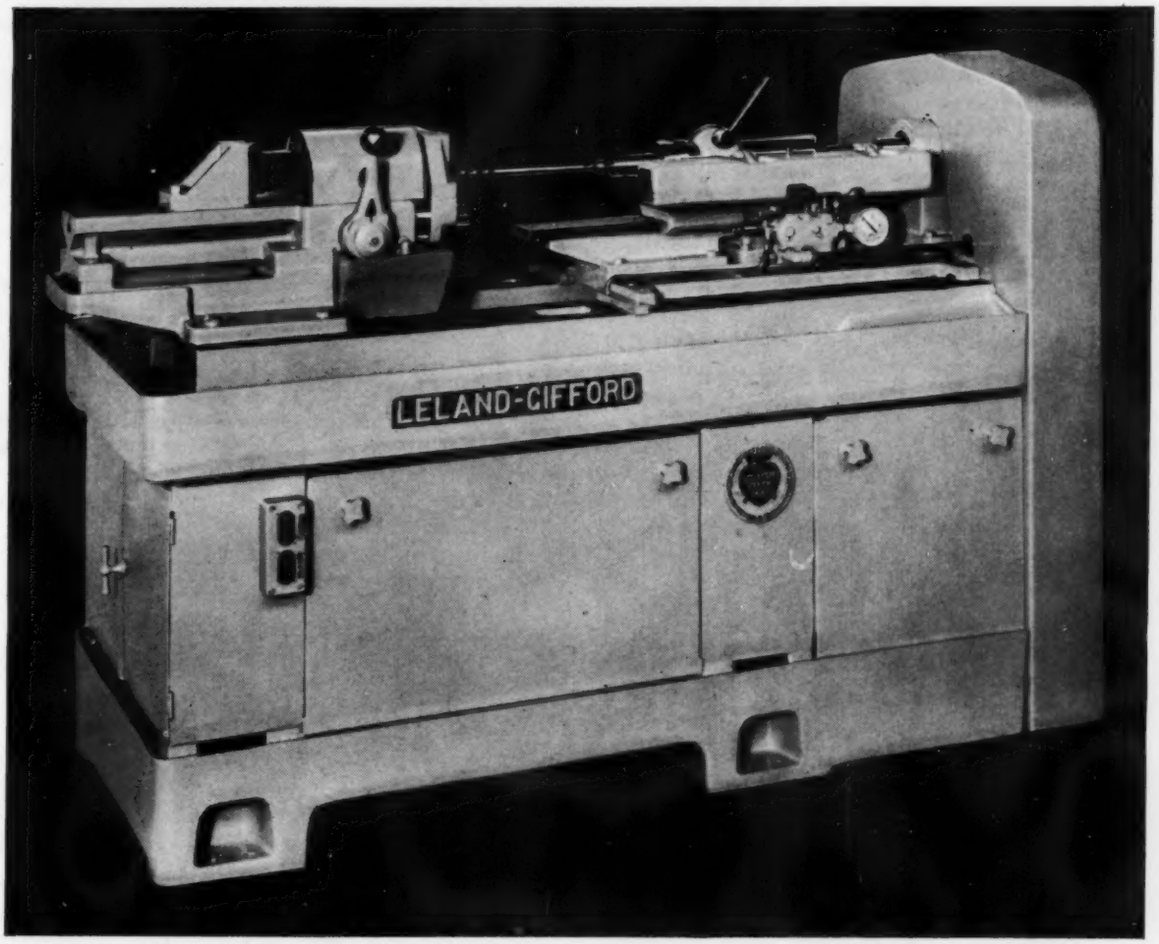
Drill straight holes

by STEP X STEP method

USING STANDARD TWIST DRILLS

for holes up to 40 diameters in depth, on this horizontal step x step deep hole drilling machine.

IT IS NOT NECESSARY TO ROTATE THE WORK.



Single or twin spindle. Three lengths of traverse. Several lengths of bed.

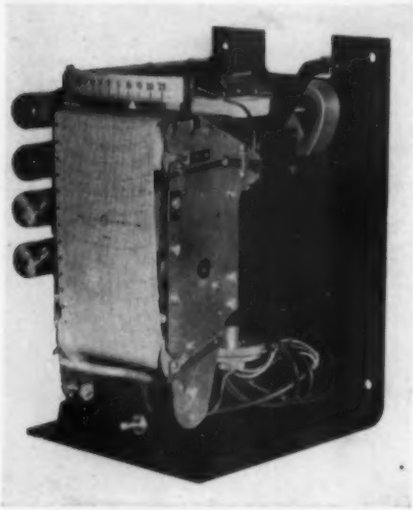
LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS U. S. A.

Revolving Brush, Dust Control Offered on Tennant Power Sweeper

A high-speed power sweeper, equipped with a 26-in. revolving brush and vacuum dust control is said to enable one man to sweep up to 44,000 sq. ft. of floor per hr. Offered by G. H. Tennant Co., 2530 N. 2 St., Minneapolis 11, Minn., sweeper has a self-starter. It is driven like a car, and is powered by a 6-hp. air-cooled gasoline engine.

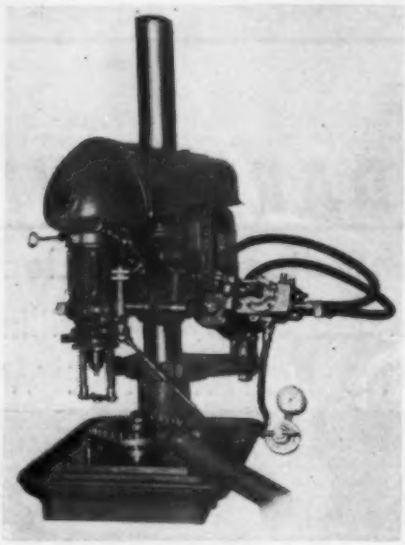
A pedal controls forward and reverse motion; another serves as a foot throttle. The removable brush can be raised or lowered by a lever.



Photoelectric Recording Wattmeter By GE, Analyzes Welding Circuits

A photoelectric recording wattmeter designed for analyzing welding circuits and measuring industrial heating load, motor-starting load, and power surge, is offered by the Meter and Instrument Div., General Electric Co., Schenectady 5, N. Y. The instrument consists of a high-speed photoelectric recorder and a wattmeter measuring unit, and can be used to measure dc. or ac. power up to 10,000 cycles per sec.

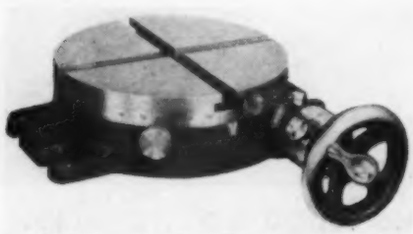
The wattmeter has a linear scale and is available for portable use or for semi-flush mounting. Chart speeds from ½ in. per hr. to 72 in. per min. can be obtained. Current circuit is rated either 5 or 10 amp., and the potential circuit either 120 or 240 v.



Automatic Reciprocating Air Drive For Drilling, Reaming, Tapping

A reciprocating air drive is announced by Cinema Tool, 331 West 27th St., New York 1, N. Y. A drillpress can be tooled with dial feeds or comparable devices, and is then said to be capable of 20,000 cycles in a working day. Control is said to be sensitive enough to drill 0.0225-in. holes, and to hold to accurate depths.

Drive can be operated at 40 psi., and is applicable to any standard drillpress for reaming, drilling, tapping, and assembly operations. Drive illustrated is automatic, with a foot-switch model available. Drive can be adapted to other machinery requiring reciprocating motion to turn a shaft.



ROTARY LAYOUT TABLE, calibrated in 360° of rotation, is made by The Erwood Co., 214 Woodstock St., Crystal Lake, Ill. Designed for accurate layout work in toolrooms, index on the adjusting spindle permits settings to within 6 in. Base, which is provided with four mounting slots, is cast from nickel-alloy iron, and ground on both sides

Printing, Developing Machine Features Replaceable Units

A reproduction machine called the Direc-Liner printing and developing machine is announced by Reproduction Products Co., 12790 Westwood Ave., Detroit 23, Mich., together with Economy Blue Print Products Co., 1714-20 North Damen Ave., Chicago 47, Ill.

The machine, equipped with Hanovia-type printing tube and revolving cylinder, develops prints by the ammonia-vapor method, accommodating cut sheets or rolls in two unsynchronized operations. The Direc-Liner features a packaged construction which makes it possible to replace the entire printing or developing unit from stock.

Lyon-Raymond Pallet Truck Fitted with Winch and Ramp

A hydraulic pallet truck fitted with winch and ramp is adaptable for handling heavy cases weighing up to 6000 lb. Offered by Lyon-Raymond Corp., Greene, N. Y., a case is drawn up the ramp and on the truck platform by means of the winch and cable. Winch is furnished with 15 ft. of steel cable. The ramp is hinged and easily removed.

GOOD!

...from every angle

The New
MONARCH SERIES 60
Long Bed Lathe

Yes, it's good to look at. It's even better to operate—this new Monarch Series 60 Lathe, now available in extra length beds.

Rigidity—so necessary in turning long jobs—is provided by heavier-than-average triangular bridge-type bed, with up to three heavy, box-type center legs. Accuracy is insured by such exclusive constructional details as the famous Monarch Flame Hardened and ground bedways. Speed of operation—a feature of every Monarch Lathe—is maintained in spite of the most exacting demands.

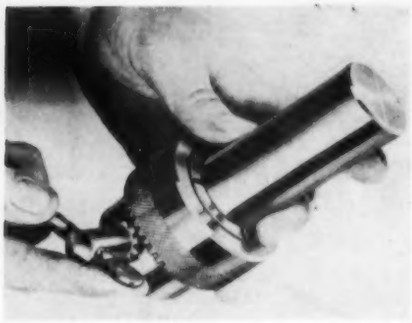
The Series 60 Long Bed Lathes are available in sizes up to 318″ between centers for the 14″ and 16″ machines, up to 312″ for the 18″ and 20″ machines. Write for descriptive literature.

THE MONARCH MACHINE TOOL CO.
Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER*—TURN TO MONARCH

Parts and Materials

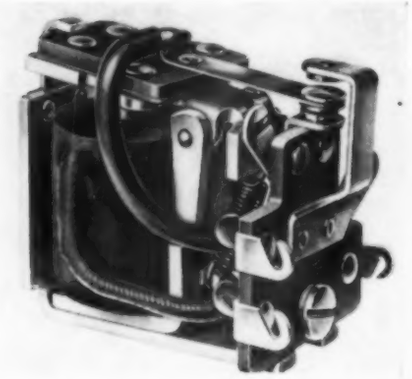


Martin 2-in. Collet Chuck Designed With No Projections

The Martin 2-in. collet chuck which is said to provide a viselike grip with a simple twist of the chuck sleeve, is offered by Alex Ronald, 333 East 53rd St., New York 22, N. Y. Design features no rough projections to mar work or injure fingers.

Seven sizes of round stock can be accommodated in the chuck with the three collets which are slotted at both ends. The small collet will take ½-, and ⅝-in. stock; the medium collet takes ¾-, and 1-in. stock; the large collet 1¼-, and 1½-in. stock; and the chuck without a collet takes 2-in. stock.

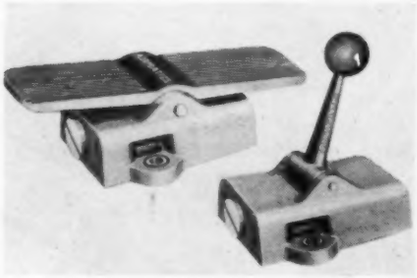
Chucks are available to fit either 1- or 1½-in. 8-thread spindles.



Allied Single-Pole Type AS Relay Available for Both ac. and dc.

A small, light, medium-power, single-pole Type AS relay is marketed by Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y. Unit is 1⅝ in. long, 1 13/16 in. high and 15/16 in. wide, and weighs 50 grams.

With a power rating of 1 watt, relay is available for both ac. and dc. Contact arrangements include normally closed, normally open or double throw. Its contact rating is 5 amp. at 24 v., dc., or 110 v., ac.



Hand-, Foot-Controlled Valves By Airmatic Are Air Controlled

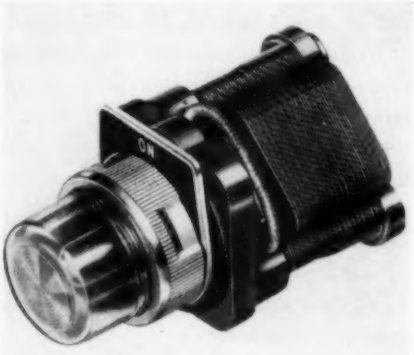
Two non-corrosive hand- and foot-controlled valves, Model HF-3, (3-way), and Model HF-4 (3-way), have precision-machined internal parts and are designed for locking or non-locking with neutral. Made by Airmatic Valve, Inc., 1643 E. 40th St., Cleveland, Ohio, valves are adaptable for control of small single-acting and double-acting cylinders on continuously operated machines. These air-controlled valves are available in ¼-in. size, in either hand or foot model.

Greer Hydraulics Shutoff Valve Features Induction-Brazed Points

Greer Hydraulics, Inc., 454-18th St., Brooklyn 15, N. Y., introduces a high-pressure shutoff valve featuring induction-brazed joints which are said to be capable of withstanding pressures up to 20,000 psi. without leakage. Valve was designed for use in systems operating pressures up to 5000 psi.

The poppet valve is threaded to match the valve stem whose movement is rotary. Turning the valve stem moves the poppet toward its seat which makes a seal when contact is made. Unions are flushmated.

FORK TRUCKS for low-headroom duty are offered by Yale & Towne, Philadelphia, Pa. A short 68-in. mast height is provided for ceiling-limited areas. The mast has a telescopic extension to permit high tiering. Truck, a model of the company's light-weight, low-capacity Zephyr line, is 58 in. long by 38 in. wide and has four forward and reverse speeds



OIL-TIGHT pilot light designed for machine-tool applications where cutting oils and coolants are used, is offered by Industrial Controller Div., Square D Co., 4041 N. Richards St., Milwaukee 12, Wis. Pilot light is designed for panel mounting through a hole 1 7/32 in. in dia. Color caps are available in a variety of colors and are designed for wide-angle visibility. The light is available in either an ac. or dc. version

PALLET STACKING MOTO-TRUC

PALLET STACKING MOTO-TRUC

Battery Electric Trucks and EXIDE-IRONCLAD BATTERIES

The time-saving team that cuts handling costs

In more and more plants, management is finding the right answer to its material handling problem by using Battery Electric Trucks. Time is being saved—more tons per man, per hour. Handling costs have been cut as much as 50%. More storage space is being utilized by high tiering. All combine to effect substantial savings that help to offset increased manufacturing costs.

When electric trucks are powered with Exide-Ironclad Batteries, they keep on the job, all day long, lifting, hauling and stacking materials. The completely different construction of Exide-Ironclad Batteries results in (1) high power ability, (2) high electrical efficiency, (3) ruggedness and (4) exceptionally long life. Only Exide-Ironclad Batteries have these four essential characteristics.

Speed up your material handling. Cut your handling costs. Put Battery Electric Trucks and Exide-Ironclad Batteries to work in your plant.

Write for further particulars and FREE copy of Exide-Ironclad Topics, which covers latest developments in material handling and shows actual case histories.

1888 . . . Dependable Batteries for 60 Years . . . 1948

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

"COOLIE" CONVEYING IS COSTLY

Yes, "coolie" conveying is costly because it takes so much manpower to reach modern production capacity levels. If you're using manpower in material handling — you're using a "coolie" system. Conveyors keep manpower on the production line! Investigate Standard Conveyors to handle pieces, parts, units, assemblies, cases, cartons, boxes, barrels, bales, bundles, packages — everything from mail to malleable iron castings! There's one to meet your needs in shop or warehouse. Standard Conveyor Co., General Offices: North St. Paul 9, Minn. Sales and Service in Principal Cities.

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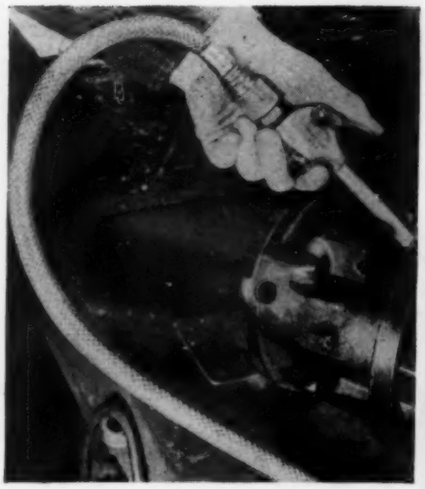
Standard GRAVITY & POWER CONVEYORS



SYNTHETIC BODY for its tubing is announced by Ronaflex Tubing Co., Inc., Packard Bldg., Philadelphia 2, Pa. Buna and Neoprene base synthetics are used and are said to stand up under high temperatures and pressures. Various capacities are available. Assembly illustrated is carrying air at 80 psi. Standard sizes from ¼ to 2 in. I.D. and in a range of lengths up to 200 ft. in the small diameter and 50 ft. in the largest diameters are supplied

Radial-Thrust Ball Bearing Has Solid-Bronze Retainer

A small ground angular-contact (radial-thrust) ball bearing is offered by New Hampshire Ball Bearings, Inc., Peterborough, N. H. This Micro ball bearing is of a non-separable design, with a machined, solid-bronze retainer carried by the ground lands of the inner ring. Dimensions are 5/64 in. bore by ¼ in. O.D. by 3/32 in. wide, to ABEC tolerances 1 and 5.

Hard, Dry, Rustproof Coating Deposited as Thin Clear Film

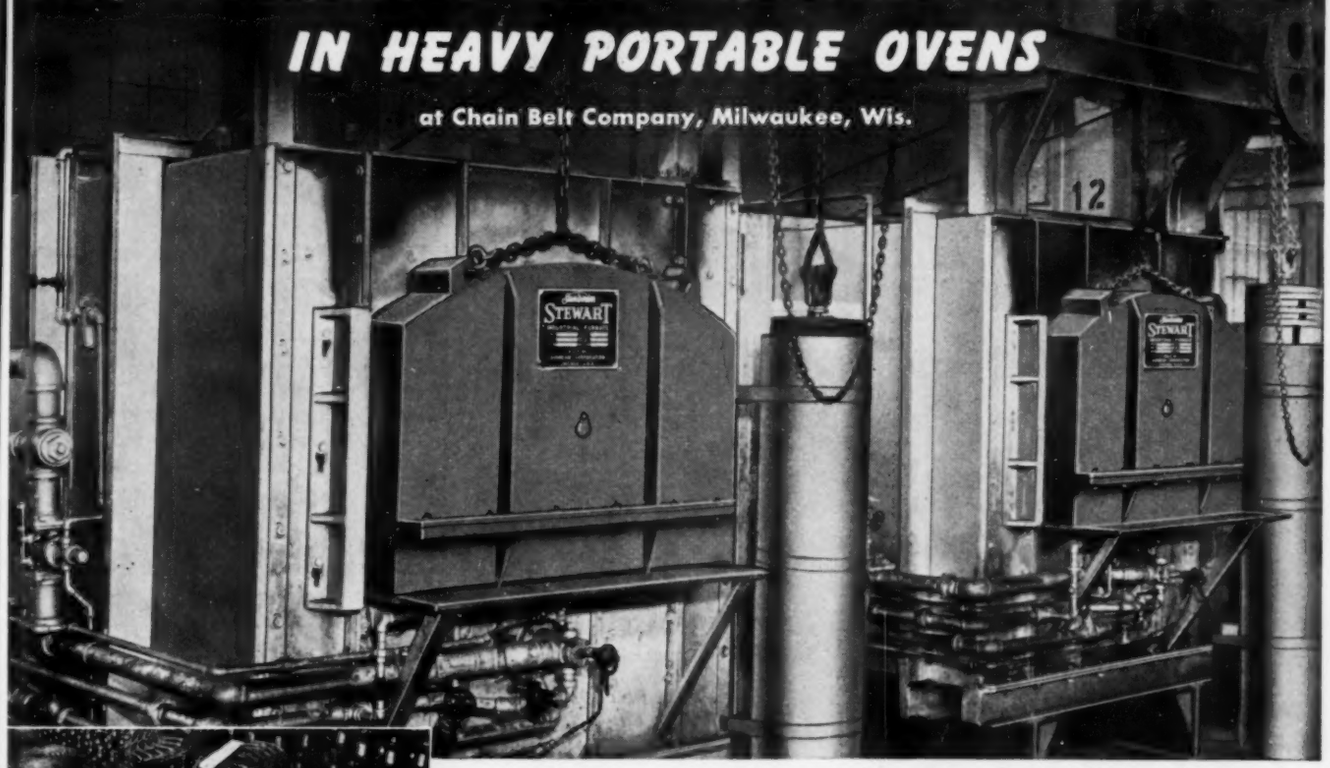
A rust preventive coating which can be applied cold by dipping, spraying, or brushing, and which forms a clear film on metal surfaces, is announced

No. 82 of a Series of Typical Installations

Sunbeam
STEWART
THE BEST INDUSTRIAL FURNACES MADE

FOR DIVERSIFIED HEAT TREATING OPERATIONS IN HEAVY PORTABLE OVENS

at Chain Belt Company, Milwaukee, Wis.



Chain Belt is using these two Sunbeam Stewart Ovens within temperatures between 1150 F. to 1700 F. However, they can be used up to temperatures of 1800 F. This makes it possible to normalize, pack carburize, anneal, and harden.

Shown above are various sizes and types of roller and link chains manufactured by Chain Belt Company. They also make transmission equipment for drives and conveyors, construction machinery, and material handling equipment.

The ability to anneal, harden and normalize 2 oz. blanks or 500 lb. rough castings in 400 to 1500 lb. loads in two Sunbeam Stewart Heavy Portable Ovens has successfully solved Chain Belt's need for an installation for general all-around work on a 24-hour operation. In emergencies, these furnaces are also used for heat treatment of parts normally heat treated in continuous production units. The flexibility of these ovens, together with the close temperature control and even heat distribution throughout the heating chambers, makes them ideally suited for the many varied heat treating operations.

These units are equipped with combination oil/gas burners to permit use of either fuel. For ease of operation, doors are automatically raised or lowered by an electric motor hoist. The units are of heavy construction, designed for years of continuous service with a minimum of maintenance.

This installation demonstrates the versatility, quality and sound engineering of standard Sunbeam Stewart Furnaces. In addition, Sunbeam Stewart builds completely automatic units to meet specific production requirements.

SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION
(Formerly CHICAGO FLEXIBLE SHAFT CO.)

Main Office: Dept. 119, 4433 Ogden Ave., Chicago 23—*New York Office:* 322 W. 48th St., N.Y. 19—*Detroit Office:* 3409 E. Grand Blvd., Detroit 2
Canada Factory: 321 Weston Rd., So., Toronto 9

A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM STEWART furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM STEWART engineer will be glad to call and discuss your heat treating problem with you.

PERMANENT MARKING *at higher production speeds*

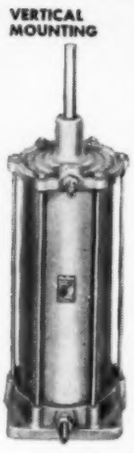
Permanent precision marking and high production speeds have made Noblewest equipment the universal standard. Employing the famous Noblewest rolling process, these machines are engineered to mark metal, plastic, hard rubber and wood products. Model 157, illustrated, can be tooled for marking many sizes and shapes of pieces. Has pneumatic die pressure with absolute uniformity of impression, and automatic unloading feature. For further information on this and other models write Noble & Westbrook Manufacturing Co., 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

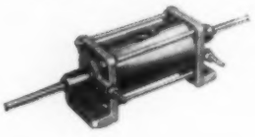
NOBLEWEST

DOUBLE-ACTION

AIR CYLINDERS



HORIZONTAL MOUNTING

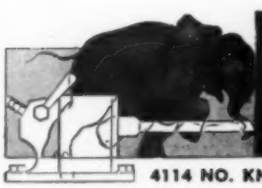


Mounting	Bore				
Horizontal	1½"	2¼"	3"	4"	5"
Vertical		2¼"	3"	4"	5"
Face		2¼"	3"	4"	5"
Swivel		2¼"	3"	4"	5"

Length of stroke optional

SUSPENDED OR SWIVEL MOUNTING

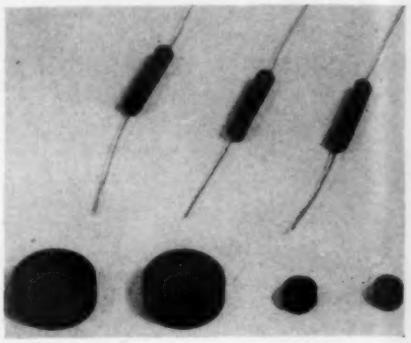
The new Mead Air Power Catalog shows the full line of single and double-acting cylinders, and air-operated Presses, Vises, Chucks, Hammers, Work Feeders—for faster, money-saving production. Write!



MEAD SPECIALTIES COMPANY

4114 NO. KNOX AVE., Dept. MA-68 CHICAGO 41, ILL.

by Kano Laboratories, 75 East Wacker Drive, Chicago 1, Ill. Coating dries in about 15 min. to a clear, hard surface. It is said to be tough, flexible and non-porous. Kano Rustproof can be removed with any petroleum solvent although it is not necessary prior to painting. Material is available in packages from 1 to 55 gal.



THERMISTORS, electrical semi-conductors that respond to temperature variations as small as one thousandth of a degree Centigrade, are made by Metallurgy Div., General Electric Co., Pittsfield, Mass. Devices are made from mixtures of semi-conducting metallic oxides, and are available in the form of rods, disks, and beads. Thermistors are used with either ac. or dc.

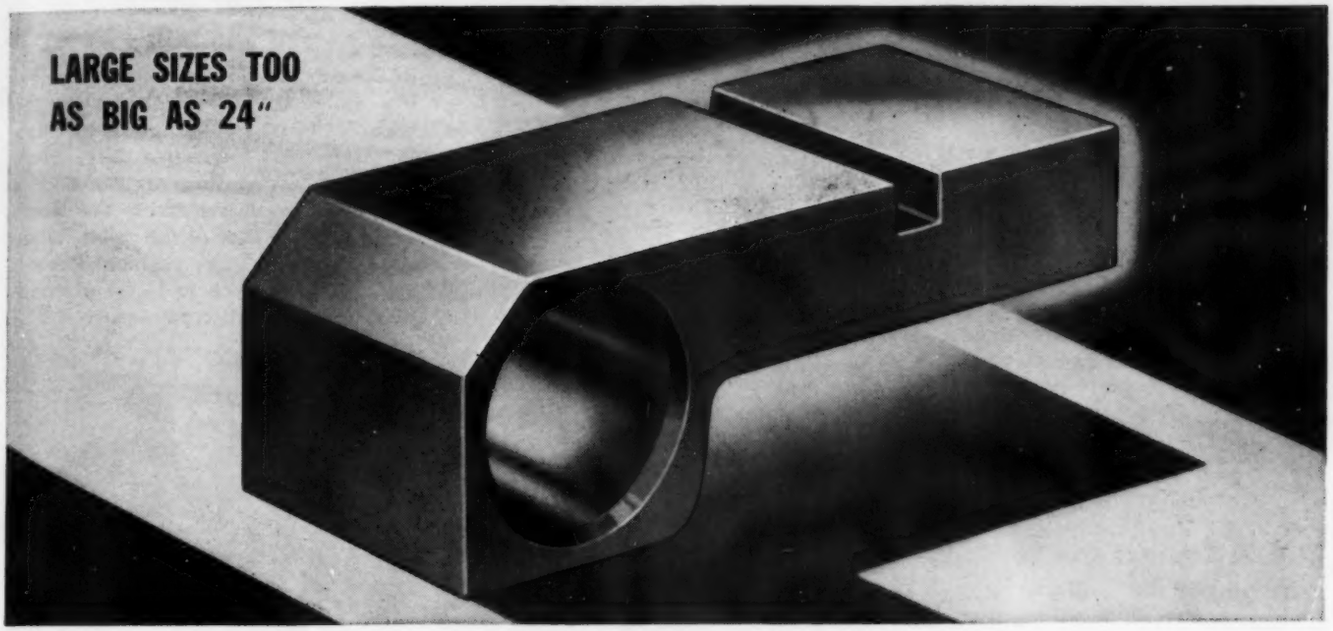
Indicator-Gage Contact Points Offer Ruby, Sapphire Points

Sapphire- and ruby-tipped dial-indicator-gage contact points are introduced by Corundum Co., Inc., 1777 E. 87th St., Cleveland 6, Ohio. Points are made with hexagonal buffed stainless steel bodies 0.187 in. across flats and 0.437 in. long with 4-48 thread 0.187 in. long. The jewels are ⅛ in. in diameter with 0.187-in. point radius cemented and spun into the bodies and brought to a high polish, and are said to fit practically all bench types of indicators.

PRESSED-STEEL sheaves called Power Master are manufactured in A and B sections, single and double groove from 4 to 15 in. inclusive. Made by Howry-Berg Steel and Iron Works, 2949 N. Speer Blvd., Denver 11, Colo., the demountable hub permits single-, dual- or step-pulley arrangement to fit V-belt applications

OILITE

Finished MACHINE PARTS



with NO Machining...

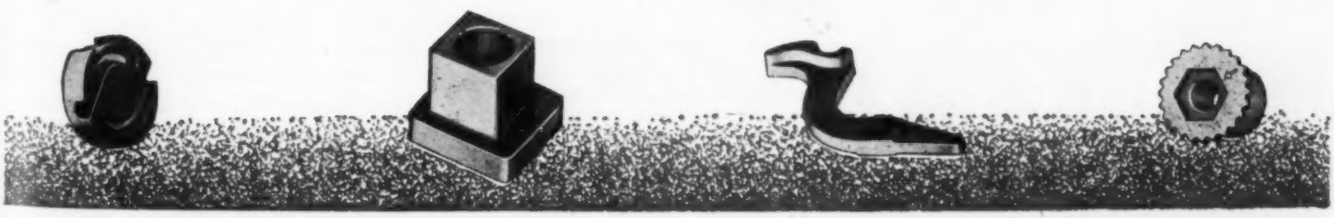
Finished OILITE parts made from metal powders offer you many advantages including the following:

- ★ **Precision parts at lower cost.**
- ★ **More than 20 types of machining operations eliminated.**
- ★ **Mass production even on designs involving profiling and "depressions".**
- ★ **No capital investment or tooling programs on your part.**
- ★ **Parts impossible to machine economically can be made readily of OILITE—allowing you greater freedom of design.**
- ★ **Complete engineering service at plant and in the field.**
- ★ **Parts of either ferrous or non-ferrous materials.**
- ★ **Metallurgically and structurally homogeneous—no imperfections.**
- ★ **Self-lubricating surfaces if desired.**
- ★ **Quicker delivery assured.**

Send your blueprints to Field Engineer or Home Office. Address Dept. G

AMPLEX MANUFACTURING CO. DETROIT, 31 MICHIGAN

Division of Chrysler Corporation



FIELD ENGINEERS AND SUPPLY DEPOTS IN PRINCIPAL CITIES

HOW LONG—

SINCE YOU'VE WRITTEN OFF YOUR OLD DRILLING MACHINES?

MODEL C-20 SIBLEY
20" SWING DRILLING MACHINE

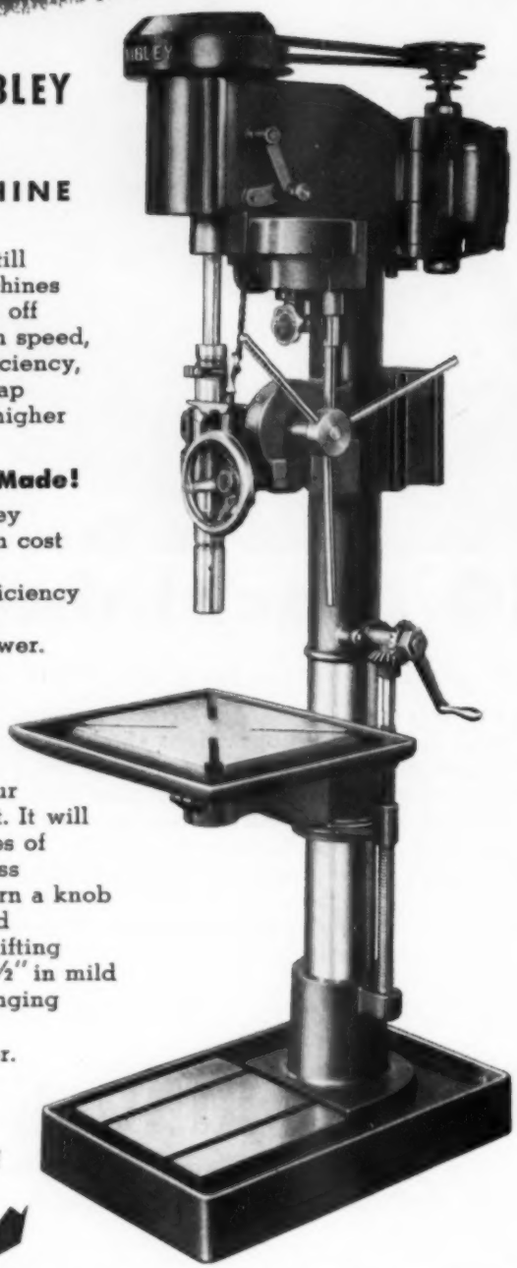
Many manufacturers are still operating old drilling machines whose costs were written off years ago. Now obsolete in speed, accuracy and operator efficiency, they are a decided handicap in paring costs to offset higher labor rates.

Cost Savings Can Be Made!

The new model C-20 Sibley will furnish you savings on cost per piece by—

1. Increased operator efficiency and output.
2. Greater speed and power.
3. Finer accuracy.

Install a new model C-20 in your plant and make a Time and Motion Study comparison with your present drilling equipment. It will demonstrate the advantages of such features as easy access to controls—where you turn a knob to select the proper geared power feed; convenient shifting of V-belt; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M. powered by a 2 H.P. motor.



GET COMPLETE INFORMATION ON THE SIBLEY MODEL C-20

SIBLEY
MACHINE & FOUNDRY CORP.
25 EAST TUTT STREET
SOUTH BEND 23, INDIANA

SIBLEY MACHINE & FOUNDRY CORP.
25 E. Tutt St., South Bend 23, Indiana
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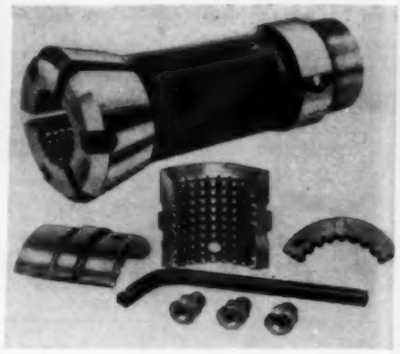
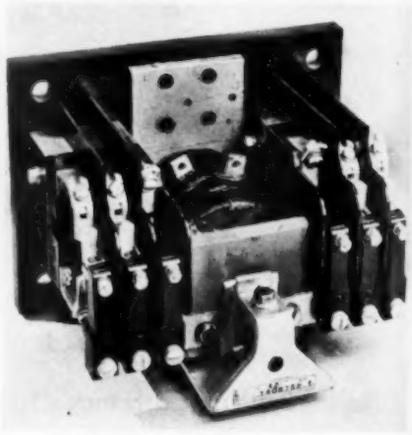


PADS can be changed without removing collet from the spindle on the style SM Master collet made by Sheffer Collet Co., Traverse City, Mich. Pads are held in place by means of a standard socket set screw that locks a T-slot in the face of the collet. When collet is in the open position, there is sufficient clearance to insert a standard socket-screw wrench



Heavy-Duty Magnet-Operated Relay Comes in Varied Pole Combinations

A heavy-duty rear-connected multipole dc. magnet-operated relay is offered by Westinghouse Electric Corp., Pittsburgh 30, Pa. Listed as model AYB, relay is available in 4-, 6-, 8-, 10-, 12-, or 14-pole combinations.

Relay is designed for operation on 600 v. or below. All contacts are double-break silver to silver and will carry 10 amp. continuously at rated voltage. Featured is fast drop-out of contacts when coil is deenergized.

X-Washers for Small Pins Are Single-Unit Assemblies

A series of X-washers for pin sizes from 7/32 to 17/32 in., is introduced by Standard Locknut & Lockwasher, Inc., 311 North Capitol Ave., Indianapolis, Ind. Washers offer the advantages of a single-unit assembly which can be clamped around the pin. Its 360° closure is said to support a heavy thrust load.

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DATA FOR TAPPING OPERATION:
OPERATION: TAPPING 2 HOLES-5/16" DEEP THROUGH-12-24 TAP
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The SNOW Full Universal Tapping Machine is complete with electric controls, motor driven lubricant pump, air operated table lift, and dirt and moisture trap.

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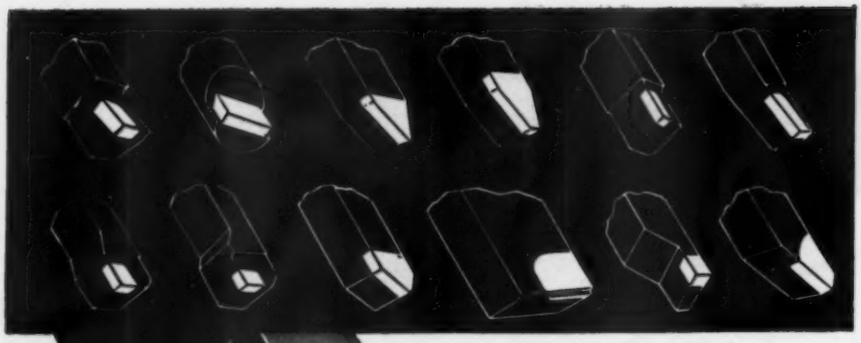

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ROUND TABLE *Discussion*

EXCUSE OR EXCELLENCE?

Results of the aftermath of war are that plants will have been given harder and more continuous use, with less attention to working conditions; labor will have had to recruit from sources already depleted by the needs of war; material will probably be difficult to get. Unfortunately, these weaknesses are not automatically corrected by the cessation of hostilities.

Standards of qualiity must be maintained, however, and it is the duty of the staff to strive to get the desired result. That their obtainment may be more difficult than formerly is to be expetced, but much can be done by intelligent recognition of the fact and adaptation to the circumstances.

The same spirit is necessary as in war time. Then raw labor had to be trained to do skilled work, and operations were simplified to meet the conditions. Operations weer split to suit either semi-skilled labor or machines which had lost their fine accuracy. Finishing operations were reserved for the most skilled labor and the more accurate machines. Until steps of this kind have been taken, the man who offers excuses for bad work is merely advertising his own incompetency, his inability to improvise. But is not a poor workman always prone to blame his tools?

With respect to material, the shop man cannot convert bad to good; he cannot make a silk purse out of a sow' ear, but he should make the best article possible out of the material available. At the same time, bad material will remain bad, even if it is goldplated. This is beyond his ken or responsibility.

J. E. Powell
Glos. England

•

RATING OR RATTING?

We debated the subject of merit rating at a foremen's discussion group meeting recently. The foreman grinder, who is avid on the subject of progress and high quality, was all for it. He was strongly of the opinion that merit rating had come to stay and that "influence sheltereds" would have to go. No one challenged this in fear of being thought a "sheltered."

The old millwright foreman

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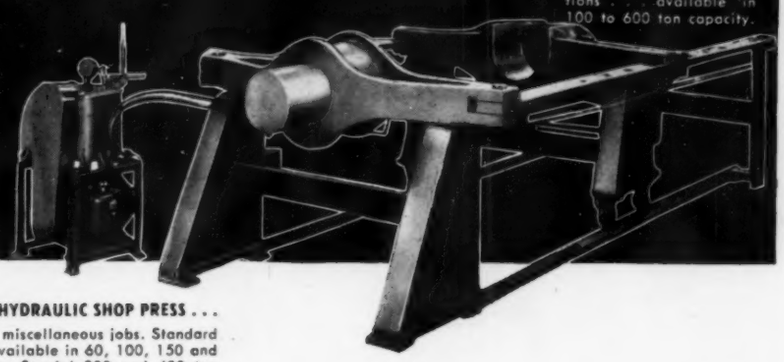

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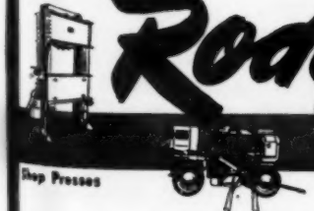

Shop Presses

Crawler-Track Presses

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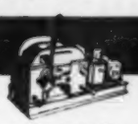
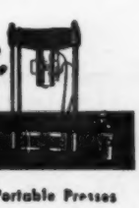


Power Pump Units



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thought the idea good enough for the younger men, but could not see much in it for the "over fifties," while the foreman machinist wanted to know more about who was to do the merit rating and what qualifications a rater ought to have.

The assembly foreman was enthusiastic, holding that appointment and promotion should be by merit alone. He is a bulldozer who flattens out opposition and seems to think that merit refers only to production records and has nothing to do with long service and such qualities as affability, good manners and leadership. He can see no future for a foreman who says "please" and "thank you."

The under-foreman blacksmith thought that the merit rater should be appointed by the shareholders and should be answerable only to them, just in case his reports get mixed when they reach the Ivory Tower. He seemed to be afraid that by some mischance the banners might go to someone's pet, despite the merit rater's hard work to make sure they don't. The foreman joiner, suspected of being a red, thought the scheme could work all right if it wasn't "worked," and he wanted to know who was to be the merit rater's boss and if the rater was to merit rate him.

The cashier thought merit rating, if honestly applied, might save many good men from rotting. He argued that if a man is kept ten to twenty years in the same job, that is a reflection on the progressive pretentions of the company, and if a staff man is not considered good enough for promotion, he is not good enough to be supervisor.

The foreman moulder, who is an amateur economist, argued that promotion is necessary to a good man in the matter of self respect. Money, he said, is not the greatest factor; pride plays its part. He contended that success and the joy of achievement stimulates the creative powers in man, and visible proof of the recognition of ability is given when promotion comes along. He agreed that a salary increase without promotion was not to be sneezed at, but called that "invisible recognition" of ability, since that was a matter which had to be kept quiet for obvious reasons.

The foreman pattern maker advanced the idea that there is such a thing as being too good for promotion. He said many men did their jobs so well that they were being continually passed over.

C. D. MacKinnon
Lanarkshire, Scotland

CODDLE OR CULL?

Most factories have a strict policy in regard to absenteeism. Due to the desire, and need, for dependable employees, advance notice of absence from work by an employee is welcomer, and is sometimes requested in booklets issued to new employees. This consideration of the employer for the employee earns him respcet. Neglect of advance notification is tolerated once or twice, but if continued, results in "culling" the worker. He, or she, is invited to find another job.

Should dependability be rewarded? This is a quality expected from good employees. Workers know that such performance is a means of deriving satisfaction, plus the respect and consideration thereby received from superiors.

The Golden Rule is applicable here. Unions specify in their labor contracts that men must have a minimum number of working hours at the factory, so why should not the employer be notified that it will not be necessary to have work ready on a particular day when an employee expects to be absent?

Edward Diskavich
Torrington, Conn.

•

The war was a contributing cause of much absenteeism, some of which has been carried over into present times. Some of it has also come from the protective laws passed by the government to assist the unions. Management actually operated under the hands-off policy, and workers could do almost anything, with the foreman able to do little or nothing about it.

Conditions should improve, if the foreman is a real foreman and knows how to handle men. It is unfortunate if he is one of the many men advanced during the war whom industry never trained. Industry talked a lot about adequately training employees, but did not get around to doing it.

Along with the better conditions of today, the foreman has a new ally in the industrial relations dept., which during the war years sprang from infancy into a full-fledged dept. in most companies. This dept. maintains files which show who the floaters are within the community, and such persons are not considered for jobs unless the opening is of a temporary nature. Also, those men who do not attend regularly to their work are catalogued and are not considered when an advancement comes along. Men soon learn about the forces working against them, and

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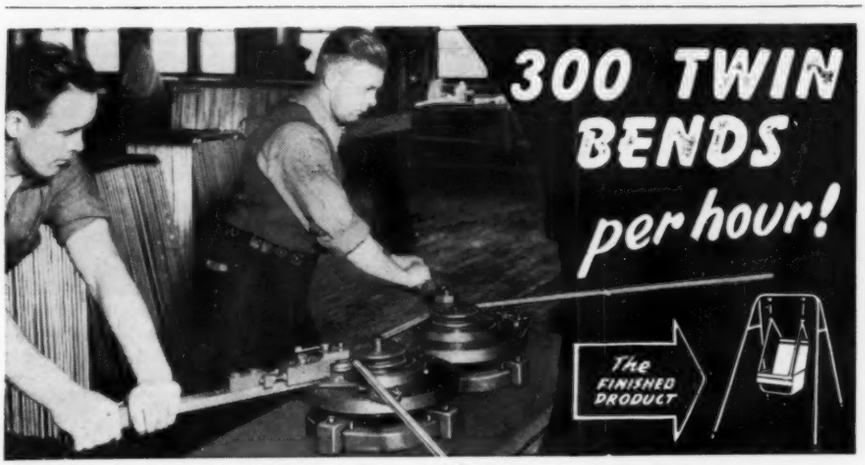

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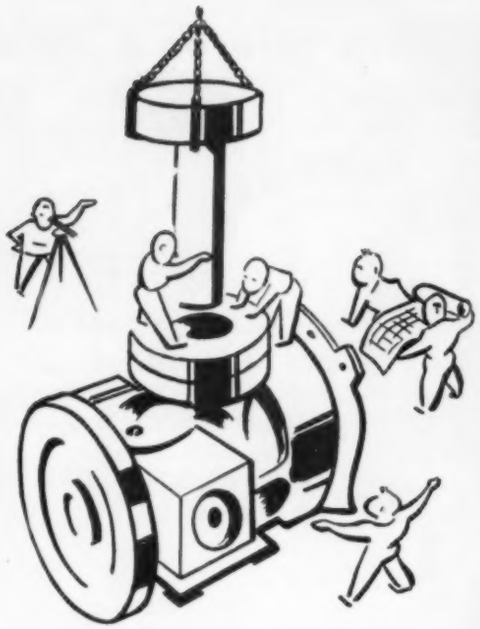

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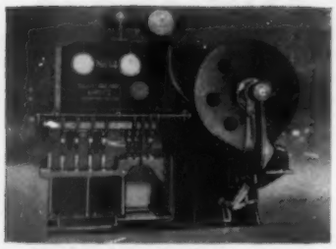

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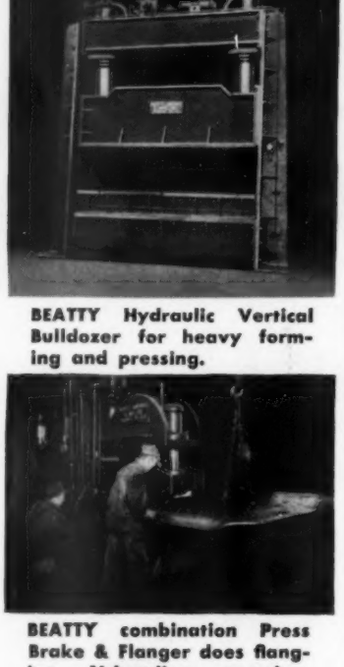

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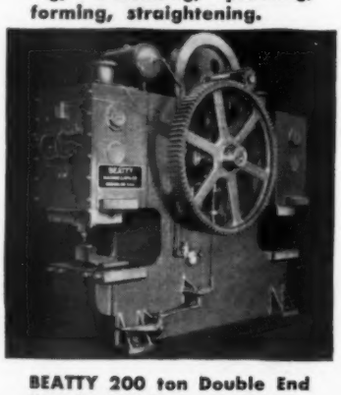

BEATTY 200 ton Double End Toggle Punch.

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they do not usually like to have a bad record written into their employment file.

The foreman can do much to help along the line. He should understand each of his men and know why time is taken. If it is strictly for pleasure, and taken without permission, the best method to follow is to issue reprimands. Usually, the first one or two will be given verbally, to be followed, if the employee does not fall in line, by written reprimands, with a copy for the files and a copy going to the employee. Complete failure to cooperate would result in termination of employment after a certain number of reprimands had been issued. This is a system followed by most companies.

A foreman should not be influenced by the fact that men are hard to get, since a man who is undependable is not worth keeping on the payroll. He only serves as a bad influence to other employees. And, too, the foreman soon finds himself in a predicament, since each employee expects the same treatment, and others will be tempted to take extra time off.

It is true that many companies are tying the attendance before and after a holiday into the holiday pay. It is doubtful if this has been an attempt to solve the over-all picture of absenteeism. Rather, it has come about due to the unions' demand for holiday pay when it was not worked. The companies had to find some way to get the value from the employee for this extra pay, and they resorted to the stipulation that in order to qualify, the employee must work the full day before and after the holiday.

This has worked a hardship on some employees, but in this day of altercations between industry and the unions, the worker has become but a pawn and is not personally considered, except when the union so pleases.

The union tells the workers that they deserve more recognition than industry is giving them and that they can do as they please as long as it is not covered by any statement in the union contract.

However, times are changing and the worker is beginning to better understand the workings of private industry and the part he, as an employee, plays. Workers are beginning to realize that they must work to earn, that profits do not grow without production.

Industry, starting with the foreman on up to the highest director or official, must try to teach the worker the truth about business operation.

When this is done, Ed will have an easier time with his men. They will all be partners in the business and working to see it succeed.

Charles D. Townsend
Centralia, Mo.

•

EXPERT OR EXECUTIVE?

I disagree with Al's idea that a foreman's skill should be managerial instead of mechanical. As Ed points out, a good foreman, in addition to knowing how to handle his men, should also be able to jump in and do any one of their jobs himself. If not, how can he expect them to respect his judgment or to turn to him for advice and help whem they run up against a problem? If a foreman just were to sit in his office and direct operations, there are many times when things would get snarled up. It is his ability to step in and make a little repair, instruct a man, or do some other mechanical job that smoothes things out in an emergency. This emergency know-how often spares the company big repair expense and the men idle hours.

The executive side of a foreman's job is equally as important as the mechanical, but the two must go hand in hand. Any man who thinks a foreman's job is superivsory alone —directing men, turning out a steady flow of work, responsibility for tools, records, etc.—is ready mistaken. A good foreman doesn't just sit back and direct—he's ready for action when it is demanded of him, and he is able to cope with any problem that arises. He can handle his men, and their jobs.

If, in addition to his being a good supervisor, a man is equipped mechanically to handle emergencies, or to pitch in and help, he has the combination that makes an ideal foreman and probably the explanation of why he was chosen for the position.

Arthur Silvester
Niantic, Conn.

•

A foreman's prime function is a managerial one. He should possess the knowledge and ability to supervise properly the work that his men do. The ability of a foreman to pitch in, or be able to, on any job, is of secondary importance. The supervisor who takes on the mantle of the mechanical expert cannot at the same time don the cloak of the administrator. Where mechanical ability is necessary, the wise foreman delegates the employment of such ability to the proper mechanics.

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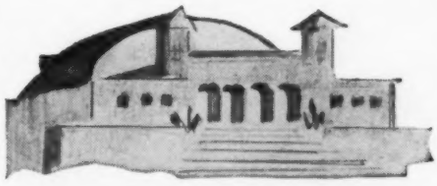

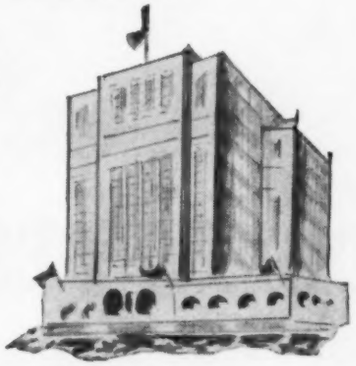

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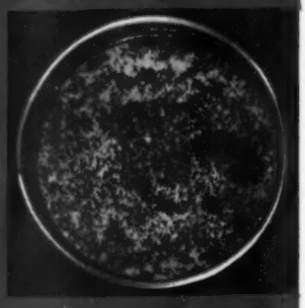

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CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

The training of the foreman is based upon the proven proposition that administrative ability is more to be desired than the mechanical ability to operate the machines in his dept.

Managerial training for the foreman has been the subject of much special attention in recent years, largely because of a growing recognition of the fact that the foreman's position is one of the key ones in an organization. The foreman has direct contact with the personnel of the organization; he administers the policies decided upon in managerial conferences, and can readily injure the most carefully planned program if he is not properly prepared.

Accordingly, greater attention has been directed to foremanship training. Fundamentally, such training is a course in leadership. It should cover the porper planning and operation of the department analysis of material, labor, and manufacturing expenses of the department, unit costs, lost and delay time, waste and spoilage, excessive costs, and cost standards. Attention should be given to good housekeeping in the plant, safety rules and procedures, care of machinery and equipment, introduction and training of new employees, and numerous more-specialized phases of individual businesses.

Generally, the training of the foreman should consider the broad principles of management, with special reference to planning, routing of materials, scheduling production, cost and quality control, and personnel functions. It is well to bear in mind that the foreman is a direct personnel manager. His understanding of labor policy throughout the organization, and of the principles involved in the personnel program as a whole, is essential to the success of that program.

In the foremanship training conferences, mutual problems should form the subject of discussion, and participants should pool their ideas and experiences in attempting to strive at improved methods of dealing with these problems. The whole attitude in this type of procedure should be one of joint exploration. The members of the group come together not to be taught, but to teach themselves, to learn together. Subject matter should be that with which the participants art thoroughly familiar from constant experience.

The function of foremanship training is the development of the efficient foreman—the administrator who has the know-how to get his men to do their best work for him.

Harry Kaufman
Philadelphia, Pa.

EASE IN OR BREAK IN?

With the stressing of human relationships in industry, and the rapid advances made in labor relations in the past decade, placing employees on the job without the accepted formalities, is an outmoded practice. However, procedures for introducing new workers on the jobs must be individually tailored to suit the size and type of organization as well as the nature of the job.

In order to maintain normal shop discipline there must be a set of rules—and the time for an employee to know the rules is before he starts on the job. In the old days when a person was hired for a semi-skilled job that person was turned over to another employee without any supervisory guidance. Such practices, in most cases, were costly, since it took a great deal of time for the new employee to learn the job. Also, under this method, the misinformation given resulted in an excessive amount of scrapped work, thereby placing the new employee in a precarious position.

Under modern management practice, it has been found that it pays dividends to train foremen to train new employees. In larger departments, where the scope of operations is diversified to the extent that the foreman cannot devote his personal attention to training, it is advisable to assign a responsible ,trained instructor to the task.

It is fundamental for management to lend all possible assistance to the new employee so that his or her skill will be brought up to maximum efficiency.

Peter L. Budwitz
New Britain, Conn.

•

A Long-Remembered Lesson

EMPLOYED in a shop was a quaint character who made the wooden patterns used in the foundry. Old Pete, as he was called, might have been the prototype of today's cartoons of barefoot, bewhiskered, hillbillies. Not too particular about washing or hair trims, he was called shiftless by more energetic persons,—but he taught me a lesson.

A boy of 17, as was I, who gets a job overhauling a steam engine, including the reboring of a cylinder and making new parts, will, as the saying goes, "feel his oats." One day I was making an effort to get the cylinder set up on the carriage of a lathe, preparatory to taking a cut through with a tool inserted in a bar, which was mounted on centers.

12Cr

OIL MAN'S *Magic Number* TO LICK CORROSION

. . . perhaps YOU have one, too!

DOWN in the oil fields, corrosion was playing havoc in gas condensate, high pressure wells. Equipment replacements were often needed at 30 to 40 day intervals.

Lebanon metallurgists and engineers made a searching analysis after which they came up with Circle L 12—a 12% Chromium Alloy. It brought good news to oil men because equipment life was extended appreciably. In some instances, examination disclosed no corrosion after more than a year.

The physical properties of Circle L 12 comply with the specifications of the American Petroleum Institute. It likewise meets ASTM specifications A-296-48 Grade 10.

What we have done for the oil industry, we can also do for you. Tell us your particular corrosion troubles. Perhaps one of the new Circle L Alloys will be your answer to longer equipment life.

LEBANON CIRCLE L 12

NOMINAL PHYSICAL PROPERTIES

API—Normalized and Drawn

Tensile Strength	90,000
Yield Point	65,000
Elongation in 2"	18%
Reduction of Area	30%

Oil Quenched and Tempered

Tensile Strength	105,000
Yield Point	90,000
Elongation in 2"	17%
Reduction of Area	35%

LEBANON STEEL FOUNDRY • LEBANON, PA.
"In The Lebanon Valley"
ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

LEBANON ALLOY AND STEEL Castings

CIRCLE L

Profit experiences-
WITH ELGIN Sapphire
WEAR RESISTANT

SAPPHIRE SHORTS P-112

SAPPHIRE GUIDES

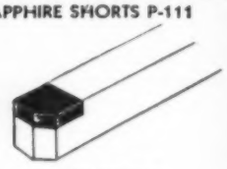
From the finest synthetic filaments making up the thread for fine hosiery to transformer wire, Sapphire guides perform longer with less damage to the work. Lower friction, better surface finish, absolute non porosity, better wear resistance are the reasons.

SAPPHIRE SHORTS P-110

MECHANICAL DEVICES

Sapphire for mechanical products — bearings, motion translators, pawls, etc. take advantage of hundreds of years experience with Sapphire in timing devices giving years and years of trouble-free service. Design Sapphire in your products for better performance — better salability.

SAPPHIRE SHORTS P-111



CUTTING TOOLS

Sapphire cutting tools — not another "Elgin first" because used in special applications for many years. First, however, are Elgin's metal bonded Sapphire blanks for attachment and finish on your own tool bits. Better finishes, on plastics and non ferrous metals.

CHECK ITEM OF INTEREST — Tear out — write name on margin — mail in for descriptive literature.

ELGIN Sapphire
PRODUCTS DIVISION, AURORA, ILL.
ELGIN NATIONAL WATCH COMPANY

I needed a hardwood block, some 4 in. thick and anywhere from one to two feet long. Hurrying to the pattern shop I found a piece suitable, except too long. Laying the stick on a pair of trestles, I asked old Pete if I might use his hand saw. He silently pointed to the saw in its case above the bench. I promptly took the saw and was about to make a random cut on the stick when old Pete spoke for the first time. "Wait." He then turned to the bench, picked a square up, pulled a pencil from his pocket and asked where I wanted it cut.

"Oh, anywhere about 15 in. long," I answered. In a matter of seconds he had a pencil line made across the block, square too, and another down the side. He then told me to saw to the lines. I did.

A smart kid could not be squelched so easily; besides in my own mind I did not consider that the old fellow knew anything about boring cylinders, so I had to talk, telling him that I did not care whether I cut the block square or not. I was not going to use the block endwise. Then I got "told."

"I can see," said Pete mildly, peering through his steel-frame glasses, "that you do not care, but that is no reason why some mechanic will have to cut the end 'offen' that stick again because you were too shiftless to do it right when you made the cut. Go about a job workmanlike!"

I may not have quoted the old man's exact words, for all this happened more than 50 years ago, but the merited rebuke is well remembered. A properly chastened kid hustled back to his cylinder boring-job with food for thought, as the carbon steel flycutter corrected the worn bore.

One thing was sure—Pete was right; my careless method of cutting a stick meant exactly double sawing, plus wasted lumber.

A simple job, to cut a stick right, or to thread a leftover piece of pipe before putting it in the rack, or for a blacksmith to dress properly the left-over end of a billet or bar from which a forging has been cut before the billet cools. But we have seen many mechanics—and foremen too—who fail to consider the other fellow or the other foreman, or the ultimate cost, having only the one thought, "We're through with our part."

Pete's wisdom might be known today as coordination, efficiency, or intensive training, but "Go about a job workmanlike" is good advice for either apprentice or superintendent.

F. M. A'Hearn
Greenville, Pa.

THEY CUT JOB TIME IN HALF . . .

with IDEAL LIVE CENTERS

Mr. Paul Schmidt, foreman winding department, Milwaukee branch of the John Oster Manufacturing Co., Racine, Wis. says: "By using Live Centers when turning the commutators on our Wound Armatures we have reduced the (handling) time by approximately 50% . . . obtain a heavier cut . . . reduce heating by friction."

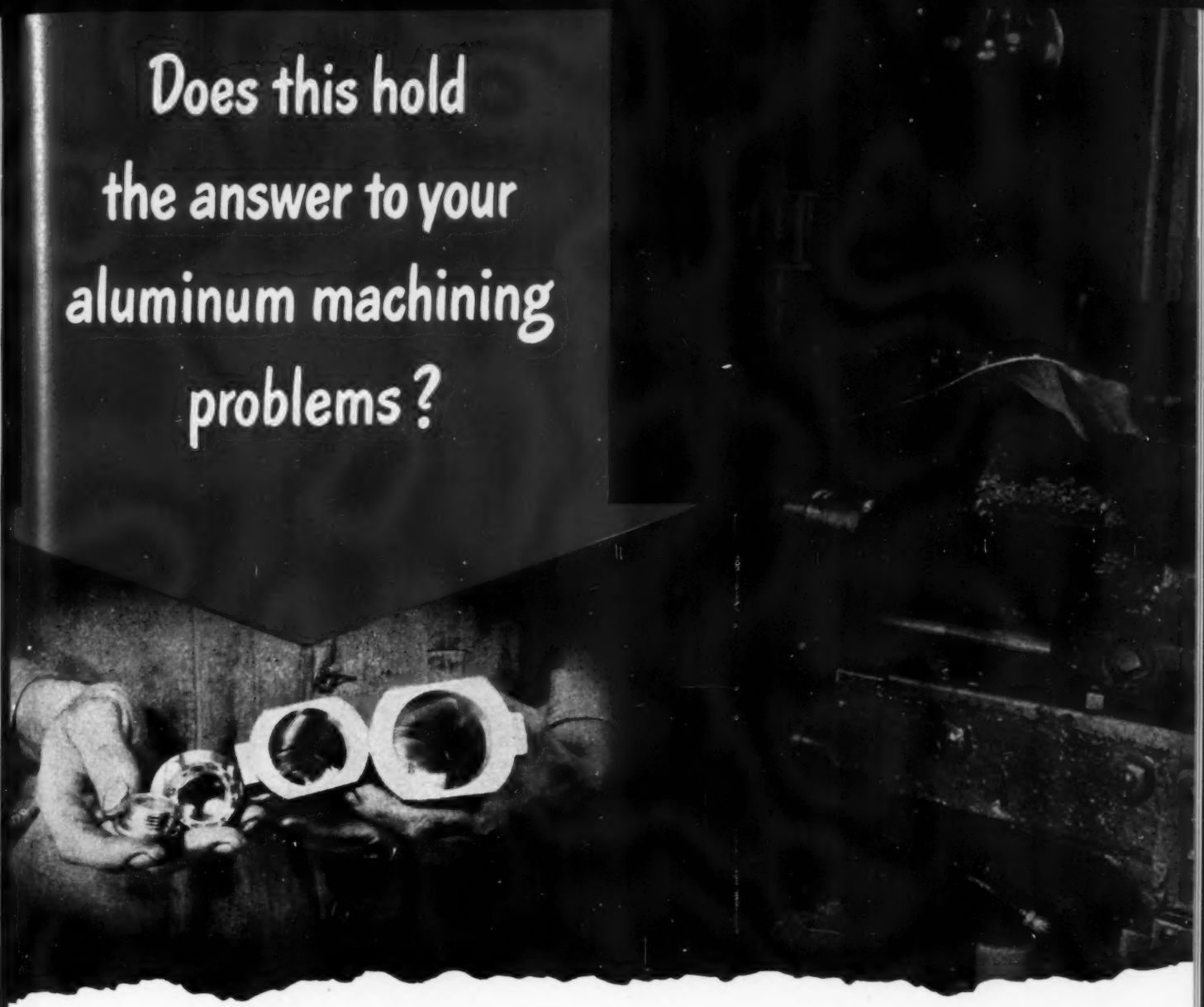
● This case history is typical of what's being reported all over the country. On light and heavy turning jobs, wherever they are used, Ideal Live Centers are raising both quantity and quality of lathe work, cutting production costs. Because they turn with the work, even on the lightest turning jobs, Ideal Live Centers eliminate all friction between work and center. There's no grabbing or gouging, no time loss for lubrication or grinding. Work is more accurate, spoilage is reduced. Deeper cuts and higher turning speeds are safely achieved. Ask for information and a free demonstration on your own work. IDEAL INDUSTRIES, Inc., Sycamore, Illinois.

Ideal Live Center with male point. Centers with female and pipe type points also available.

Also Heavy Duty Live Center — built to carry heavy loads. Accurate to .0005.

IDEAL
Distributed Through
AMERICA'S LEADING WHOLESALERS
Canadian Distributor: Irving Smith, Ltd. Montreal

Does this hold the answer to your aluminum machining problems?



switch from a conventional cutting fluid to Stanicut 62 C eliminated a honing operation on aluminum air-cylinder ousings, and lopped off six minutes of production time er part.

The aluminum housings required a high finish on inside rfaces. With a conventional cutting fluid the desired finish as obtained only after honing.

With Stanicut 62 FC the turning operation alone pro-uced the mirror-like finish shown in the above photo-aph. Production was speeded. Overall production costs ere sharply reduced.

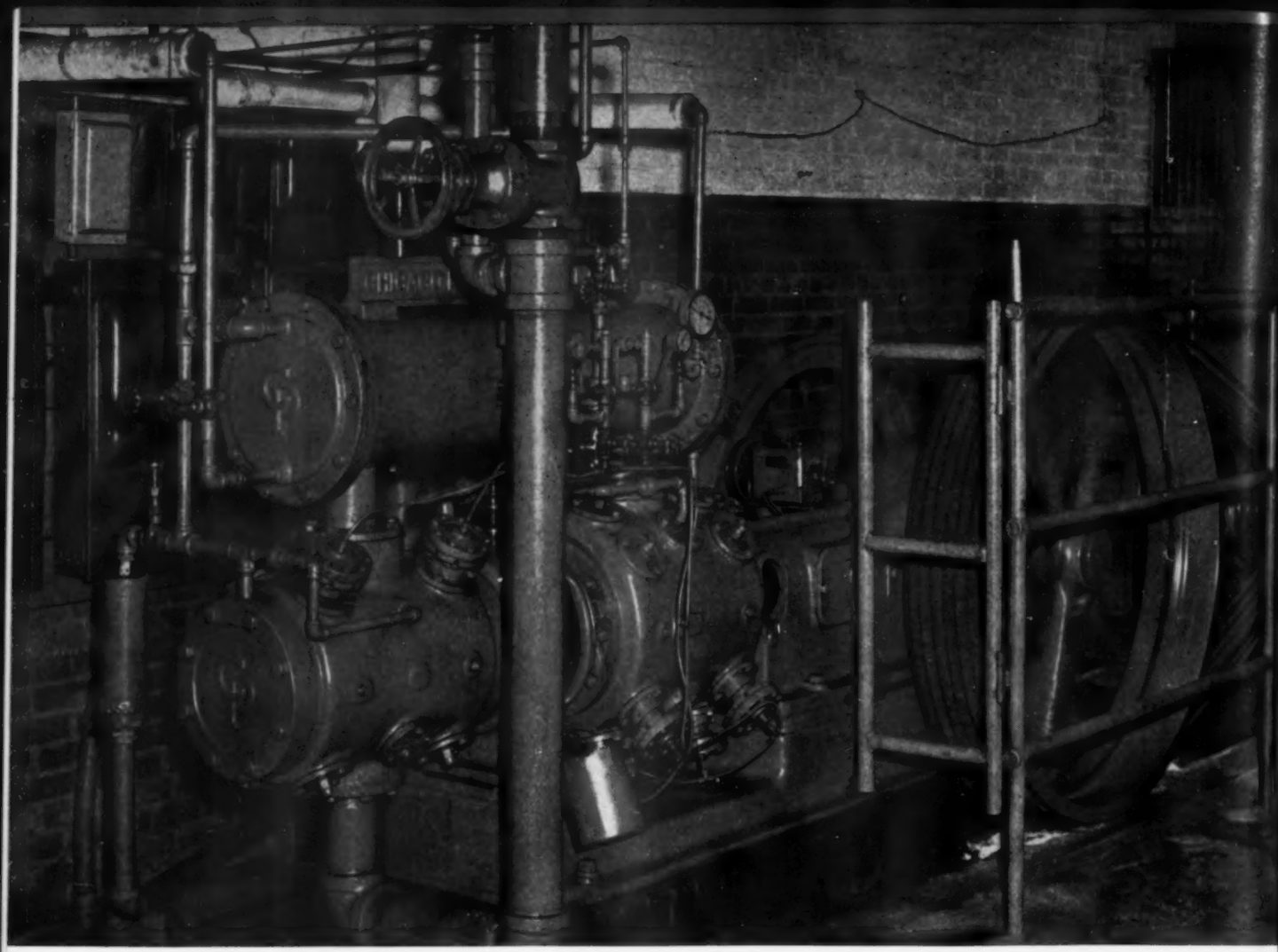
The performance of Stanicut 62 FC in this midwest metal-rking plant may hold the answer to your aluminum chining problems. Other grades in the wide range of anicut cutting oils have brought economical operation on many types of machining. All grades are compounded to give maximum tool life, high production, and good finish.

A Standard Cutting Oil Specialist will help you apply Stanicut, or other time-tested Standard cutting oils and coolants, to solve problems or to improve economy on your machining operations. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANICUT 62 FC Cutting Oil

TANDARD OIL COMPANY (INDIANA)

STANDARD



...and after that, no cleaning in 11 years!

A midwest pump manufacturer was having carbon-deposit trouble with the valves of the compressor shown above. Frequent cleaning was compulsory. Maintenance cost was high, compressor efficiency low.

"Make a test with Stanoil. Its high stability should lick your problem," said a Standard Oil Lubrication Engineer. The test was made . . . it has grown into 11 years of service (24 hours a day during the war) . . . and *no cleaning has been required in all that time!*

Clean operation with Stanoil results from its high stability plus an exceptionally effective oxidation inhibitor. Stanoil is a multi-purpose oil, that can replace many special and costly oils in your plant.

At the right are listed the principal types of equipment where Stanoil can save you money and maintenance time. A Standard Oil Lubrication Engineer will be glad to help you make a test. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

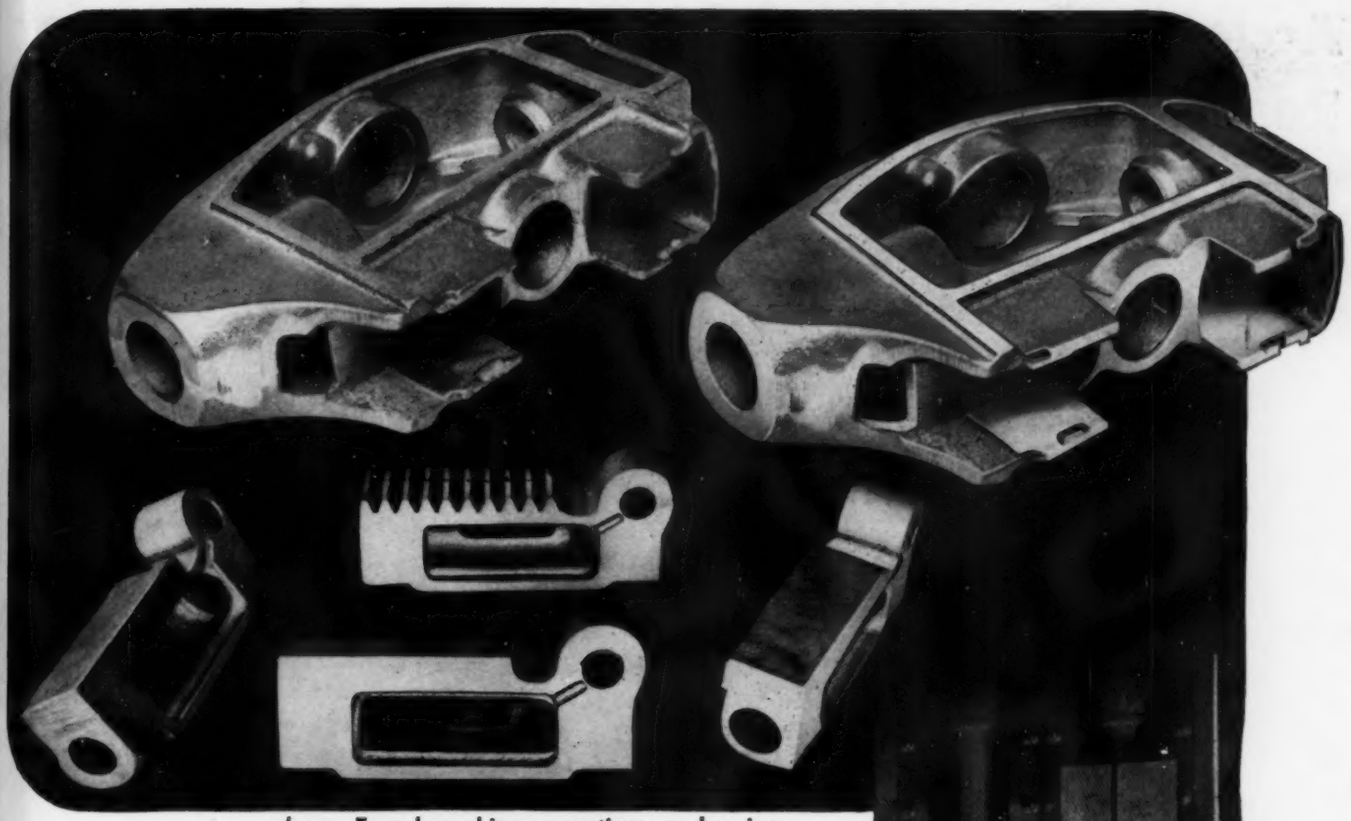
For improved lubrication of . . ,

- **Compressors and Ice Machines**
- **Power Transmissions**
- **Hydraulic Turbines**
- **Gas Engines**
- **Steam Engines**
- **Steam Turbines**

STANOIL
Industrial Oil

STANDARD OIL COMPANY (INDIANA)

STANDA

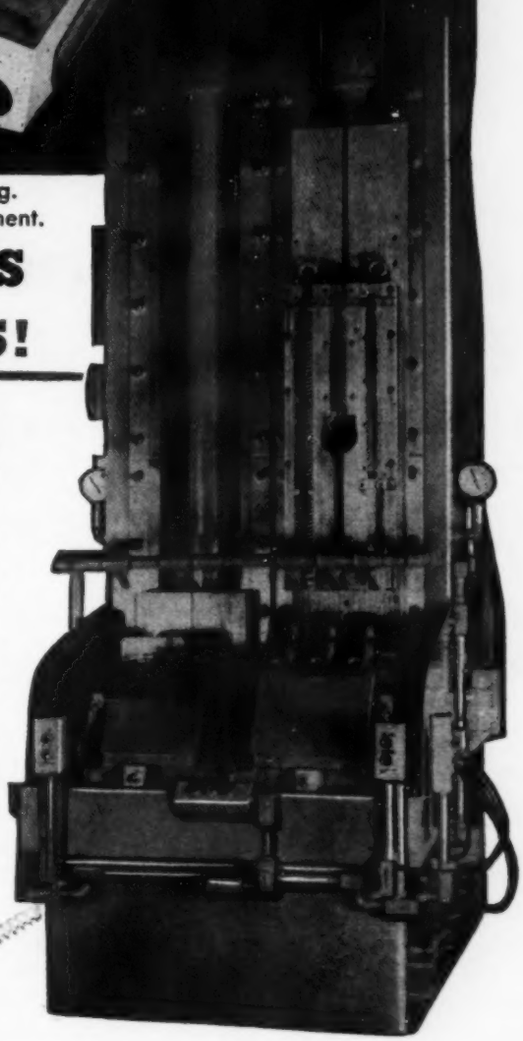


above: Four broaching operations on housing.
below: Three surfaces finished on gear segment.

MULTIPLE JOB MACHINES SAVE CAPITAL COSTS!

Yes, multiple job machines are working wonders in increasing the efficiency and economy of production in the metal working field. For example, by means of a slight change of fixtures and tools, this Lapointe standard double ram vertical broaching machine can be made to do seven distinct operations . . . and with considerably greater speed and precision than other methods. It finishes the three surfaces of washing machine gear segments at a rate of 90 pieces per hour. The four surfaces of the large housings are also machined to close tolerance at the same production ratio.

Naturally, better metal removing makes for a better product. That's why washing machine manufacturers and many other makers of metal components turn to Lapointe engineers with their metal removing problems. For additional information write dept. 56.



HUDSON LAPOINTE MASS.

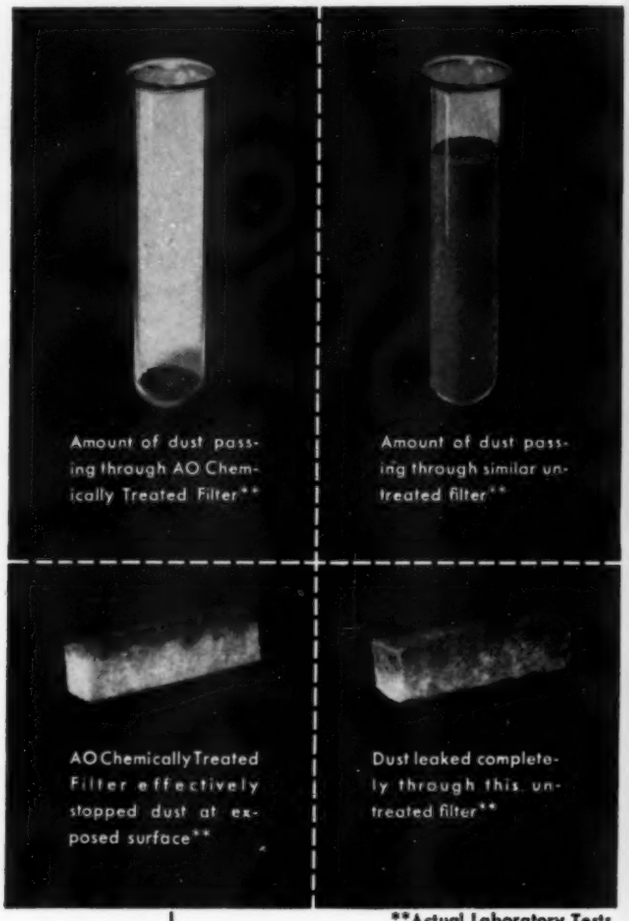
THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

Acclaimed as One of the Greatest Advances in Respiratory Protection in Years . . . the Proof . . . More and More Repeat Orders!


Amount of dust passing through AO Chemically Treated Filter**
Amount of dust passing through similar untreated filter**
AO Chemically Treated Filter effectively stopped dust at exposed surface**
Dust leaked completely through this untreated filter**

**Actual Laboratory Tests

New AO* R-2000 RESPIRATOR with Chemically Treated Filter

It is easy to understand the popularity of this new AO Respirator because *each of its advantages leads to another!* Chemical treatment of the filter provides far greater filter efficiency, hence a far smaller filter (only five inches approximately) is possible. Therefore, a smaller filter container can be used which results in greatly superior wearer comfort and improved front and side vision.

There is no increase in low breathing resistance despite the vastly increased filtering efficiency. Filter is disposable and equipped with a gauze pre-filter which adds to filter life by barring larger particles of foreign matter—an economy feature. The new AO R-18 Plastic Face Shield, light in weight, durable and easy to attach is designed for use with the respirator and protects eyes and upper face against flying particles. Your AO Safety Representative can supply you with this great advance in respiratory protection.

*Approved by the Bureau of Mines.

Read these Dramatic FEATURES!

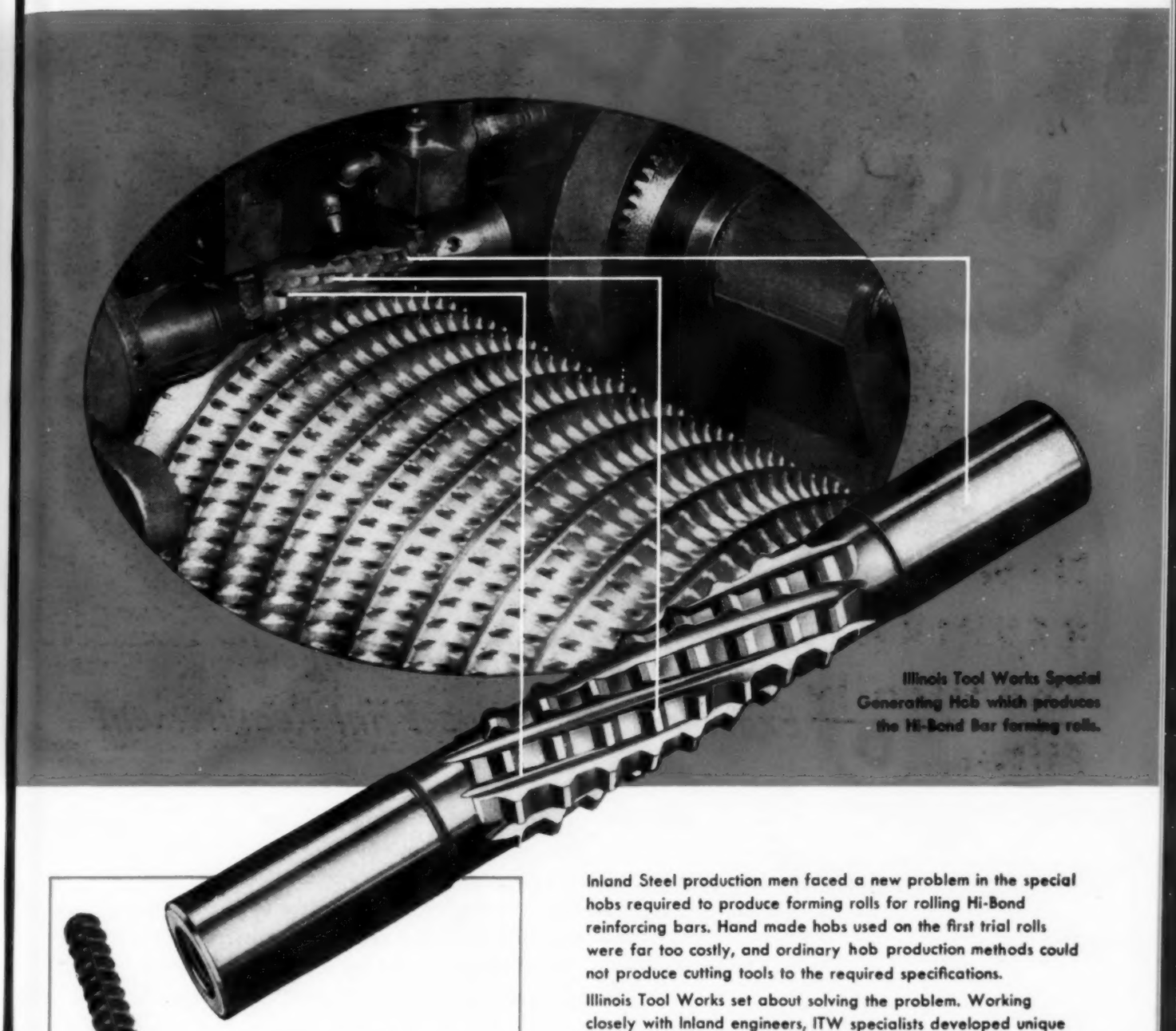
- Protects against dusts 24 millionths of an inch in diameter
- Filter does the job of similar untreated filters 8 times as large
- Chemical treatment of this filter increased its efficiency over 40 times
- Protects against a combination of dusts—toxic, nuisance and pneumoconiosis-producing

American Optical COMPANY

Safety Division

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

another "assist" for Illinois Tool



Illinois Tool Works Special Generating Hob which produces the Hi-Bond Bar forming rolls.

Inland Hi-Bond concrete reinforcing bars are produced to exacting dimensional standards by precision rolls like that shown being hobbed above. A set of two rolls, dressed and re-hobbed, will produce about 10,000 tons of finished Hi-Bond bars!

Inland Steel production men faced a new problem in the special hobs required to produce forming rolls for rolling Hi-Bond reinforcing bars. Hand made hobs used on the first trial rolls were far too costly, and ordinary hob production methods could not produce cutting tools to the required specifications.

Illinois Tool Works set about solving the problem. Working closely with Inland engineers, ITW specialists developed unique production and heat treating methods to deliver the required hobs . . . no simple task considering the hardness (400 Brinell) of the rolls to be hobbed.

These hobs for Inland Steel are typical of Illinois Tool Works cooperation in cutting tool development . . . typical of the economies that Illinois Tool Works can achieve for you. Call an ITW cutting tool specialist today!

HEADQUARTERS FOR ENGINEERED CUTTING TOOLS

ILLINOIS TOOL WORKS

2501 North Keeler Avenue • Chicago 39, Illinois

BUCKEYE "Specials"

IN ANY I.D., O.D. AND LENGTH...AND IN ANY DESIRED METAL ANALYSIS

Slotted, Split, Drilled or Flanged Exactly to Your Blue-Print Requirement

● Our 1088 sizes of ready-to-use stock bearings are the time-proved answer to most industrial bearing needs. For others, these "specials"—conforming exactly to customers' blue-print—find wide use on machines and machinery of all kinds. Manufactured from selected materials under our exacting controls, each is a quality product,—free from porosity and accurately dimensioned within the required limits, assuring speedy, easy assembly, and a maximum of long, efficient, satisfactory service. Let us quote on your "special to blue-print" requirements.

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BRASS AND MANUFACTURING COMPANY

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6412 HAWTHORNE AVE. CLEVELAND 3, OHIO

BRONZE SLEEVE BEARINGS · STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT IN ANY RECOGNIZED BEARING METAL ANALYSIS

This Head is askew

These Threads are eccentric

These Heads and Threads are true

Circle Ⓑ Bolts and Nuts . . . both standard and special . . . are used in large volume by leading manufacturers of quality products. The dependability of these bolts has been tested time after time and proven in thousands of applications.

BUFFALO BOLT COMPANY
North Tonawanda, N. Y.
SALES OFFICES IN PRINCIPAL CITIES
Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

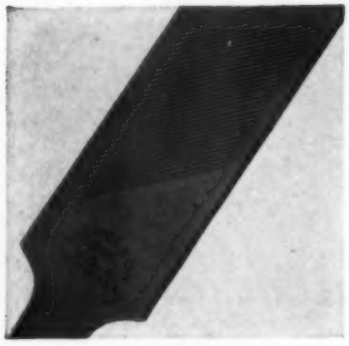
...they are CIRCLE Ⓑ BOLTS

"THE RIGHT FILE FOR THE JOB"

conserves materials, saves workmen's time, improves results—cuts production costs. This is one of a series of advertisements on special-purpose files. Save it, with the others, for shop and purchasing references.

Subject: FILES FOR LATHE FILING

Prepared by Nicholson File Co.



Long Angle Lathe File

Mill Bastard File

Lathe Filing

LONG ANGLE LATHE FILE VS. MILL FILE. The problem in lathe filing is to get the job done quickly and still secure the fine finish required. In the years past, a regular Mill Bastard file was used frequently for this work; and it is still recommended if the filer is not thoroughly experienced, for the Mill file is a little easier to use than the Long Angle Lathe file. The teeth of the Mill file, however, have a tendency to fill up with chips and consequently scratch the surface of the metal being filed. In the Long Angle Lathe file this difficulty has been reduced by increasing the angle of the teeth from 25° to 45°. The chips slide down the longer angle and are forced out at the edges by the forward motion of the file. Virtually self-clearing, the Long Angle Lathe file does the work rapidly and leaves a beautifully smooth finish.

HOW TO USE. In holding the file against work revolving in a lathe, it should not be held rigid or stationary, but should be stroked constantly to distribute the cutting action throughout the file. Operator should stand at right angle to his work and be sure his arms and hands are placed so there is no danger of their coming in contact with any moving part of lathe or piece. Pressure should be applied gently at first and increased gradually.

CONSTRUCTION AND APPLICATIONS. Every Nicholson and Black Diamond Long Angle Lathe File is rigidly tested to see that its surface is level and free from hollows that would cause scratches or grooves in the work. Made in Flat type, with "Long Angle" stamped on shoulder. Suggested for use on shafts, dowel pins, hubs, gears, rolls—in fact, anything that can be set up and spun in a lathe. Sold through industrial supply houses.

Nicholson makes special-purpose files for Brass, Lead, Aluminum, Stainless Steel, Foundry Castings, Die Castings, Die Making, Curved and Shear Tooth filing—and Swiss Pattern files of all shapes and sizes.

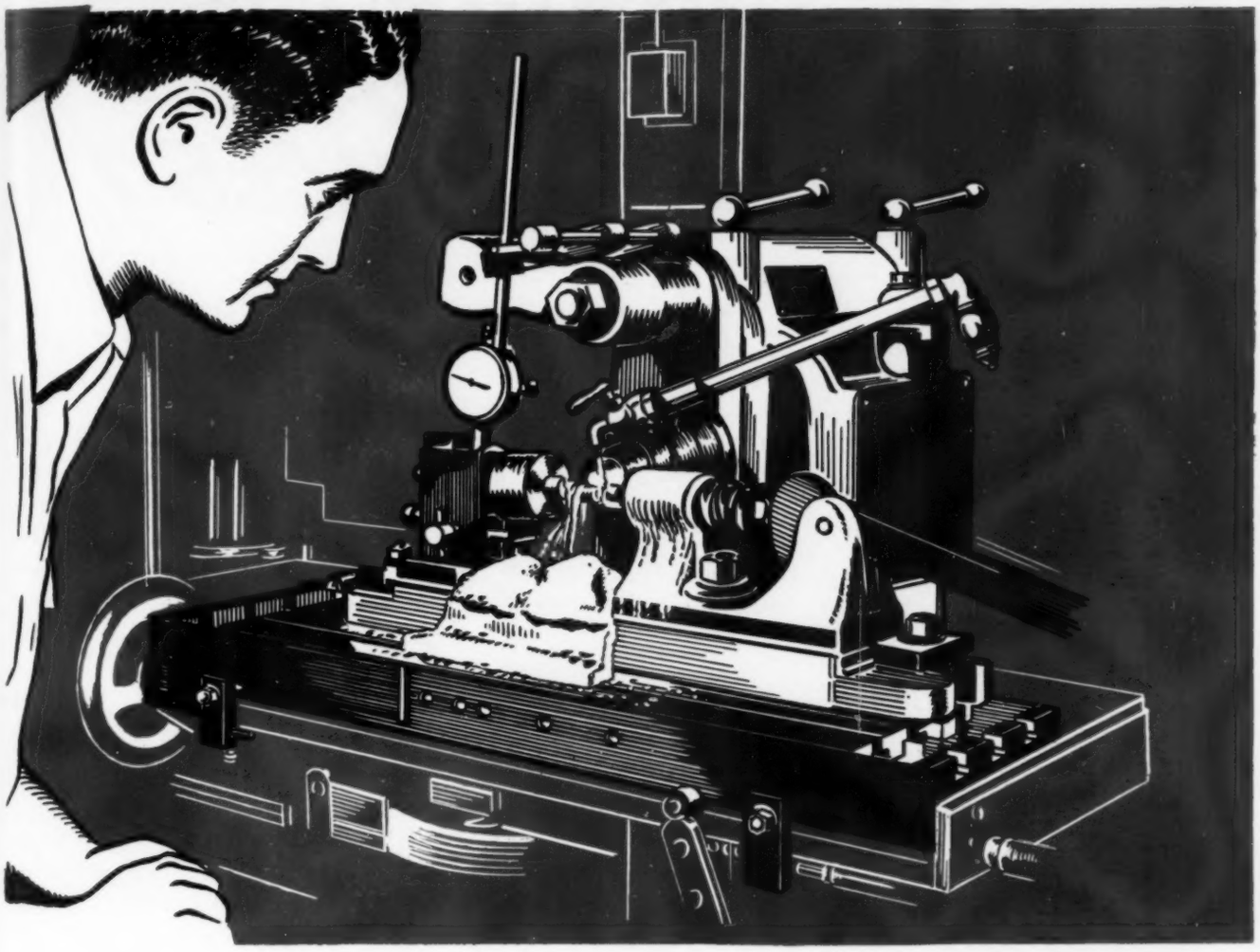
FREE BOOK—*"FILE FILOSOPHY"*

NICHOLSON FILE CO., 29 Acorn St., Providence 1, Rhode Island

(In Canada, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE

YES! Tycol Amulkut Cutting Oils perform better . . . BETTER . . . BETTER



Tycol Amulkut Cutting Oils perform better because:

. . . *Tycol Amulkut Cutting Oils* are soluble and specially designed for use as cutting fluids in emulsified form. They are available in grades for normal and heavy duty cutting operations.

. . . *Tycol Amulkut Cutting Oils* speed up production by permitting freer, faster cutting . . . assure uniformly finer finishes.

. . . *Tycol Amulkut Cutting Oils* cut costs by reducing spoilage, and prolonging tool life . . . regrindings are few and far between.

. . . *Tycol Amulkut Cutting Oils* form stable emulsions with water of normal hardness.

For complete information about Tycol Amulkut Cutting Oils and the other lubricants that make up the complete Tycol line, write today to your nearest Tide Water Associated Office.

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INDUSTRIAL LUBRICANTS

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TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE NEW YORK 4, N. Y.

LUBRICATION — "ENGINEERED TO FIT THE JOB"

Does Your Production Require FINISH GRINDING *of* CURVED SURFACES?

IF SO, INVEST IN THIS *New* GEARGRIND UNIVERSAL OSCILLATING *Precision Grinder*

The rigidity and precision construction of this machine insure fine finish.

Typical PRODUCTION ITEMS

● It's versatile! It grinds external and internal cylindrical surfaces, generated or formed spherical external and internal surfaces, external conical surfaces, internal tapers, barrel shaped surfaces, annular ball bearing races and fillets.

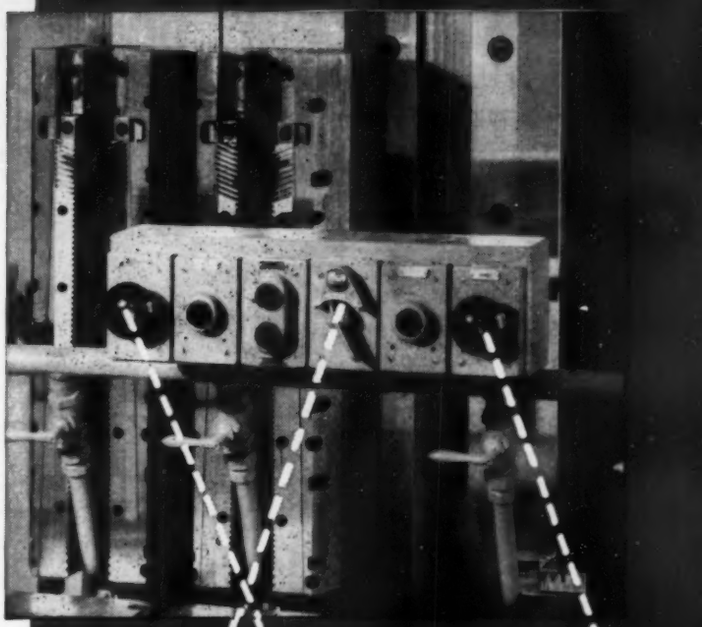
We have prepared an illustrated folder showing set-ups for many types of work that you can do better and faster with this machine. A copy will be mailed you on request.

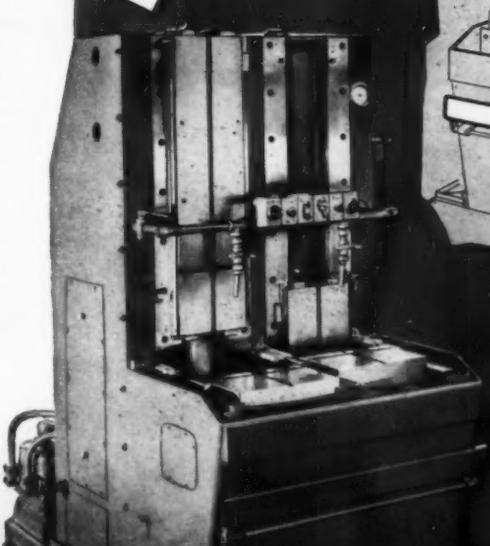
The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

THESE *Extra* CONTROL FEATURES

at No Extra Cost . . . IN OILGEAR BROACHING MACHINES

Ever since Oilgear pioneered fluid power broaching many years ago, Oilgear has constantly sought to anticipate new needs in the broaching art . . . in order that this versatile tool might be made progressively better and more productive. Today, Oilgear Broaching Machines incorporate, as *STANDARD,* many features not furnished in other machines or only available at extra cost.





FEATURES OF OILGEAR ELECTRO-HYDRAULIC CONTROLS

(The product of Oilgear's superior design and engineering)

YCLE SELECTOR. Manual push-button, semi-tomatic or full-automatic operation is selected quickly ith ease through a nearby switch. There are no pilot and quence valves and load and fire mechanisms to reset or use trouble. Selector switch can be locked to prevent tam-ering by operator and damage to tools and fixtures.

AFE CONTROL. Dual push-buttons protect oper-or against accidental starting of machine. Safe starting of roaching cycles is simple. There are no control levers, links, rings and valves to require overtravel, tire the operator d reduce production. Response to controls is instantane-us and positive; there's no needless, time-taking overtravel tool.

MERGENCY STOP. Operator can stop machine stantly at any point in cycle with emergency push-button knee bar. There's no bending or balancing on one foot depress a pedal or struggle to shift a lever. It's another tor of safety for operator and machine.

ROTECTED SWITCHES. Limit switches are ounted inside machine; protected from cutting fluid, chips, op dust and other causes of damage. Relays are concealed control panel on side of frame for easy inspection.

ese are only a few of the many exclusive atures of Oilgear Fluid Power Variable eed Broaching Machines. Write for com-ete descriptive bulletins. THE OILGEAR MPANY, 1313 W. Bruce Street, Milwau-e 4, Wisconsin.

OILGEAR

Oilgear Fluid Power

BROACHING MACHINES AND BROACHING PRESSES

. . . to suit your every need!

Do you make rivets . . . other cold-headed products? Do you need quality copper-alloy wire to be headed, extruded, drilled, or redrawn? Do you need wire of a certain degree of hardness, malleability?

Have you read the headline of this ad? Then you know the answer!

Come to Chase. Chase service, Chase quality . . . is just what you've been looking for. The word quality here means many things . . . freedom from physical defects . . . uniformity of surface texture and color . . . accuracy of dimensions . . . precise adjustment of temper and control of grain size.

Come to the nation's headquarters for brass and copper. Call your nearest Chase Warehouse or Service Office today!

Chase

the Nation's Headquarters for
BRASS & COPPER

WATERBURY 91, CONNECTICUT

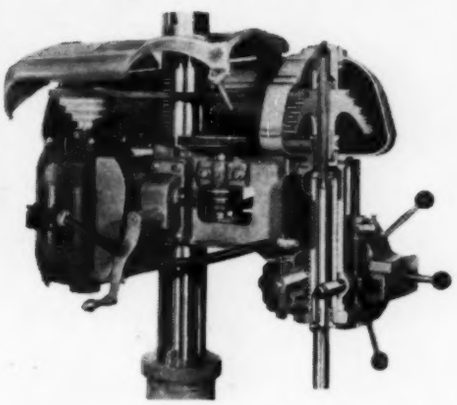
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WATERBURY (†Indicates Sales Office Only)

FOR EXAMPLE

Model D-1101X Power Feed. Price: less motor and column $216.00
D-1100X Hand Feed. $135.00*



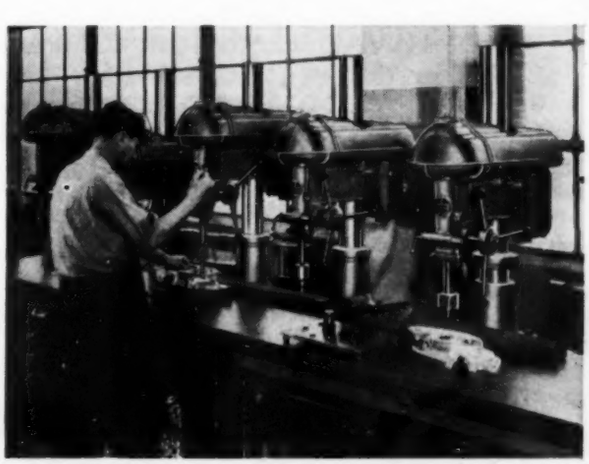
HARLEY-DAVIDSON PERFORMS *110 SEPARATE OPERATIONS* WITH WALKER-TURNER 20" DRILL HEADS

Walker-Turner Light Machine Tools solve a dual problem for the Harley-Davidson Motor Co., Milwaukee, Wisconsin, in the production of their new lightweight model motorcycle. They fill the need for *standard* machine tools capable of handling approximately 110 *separate* drilling, tapping and spot-facing operations, and *eliminate the necessity for replacing expensive, special machines when models change.*

In set-ups devised by Harley-Davidson engineers, over 100 Walker-Turner Drill Heads machine motor, brake plate and crank-case assemblies. The equipment drills holes ranging from ⅛" to 1" in diameter at spindle speeds from 260 to 2600 r.p.m. When necessary, accuracy to .001" is attained. Both high-speed steel and carbide tools are employed.

Here again, Walker-Turner Light Machine Tools demonstrate their flexibility. Compact and rugged, Walker-Turner Light Machine Tools work *all* materials from wood and plastics through tool steel . . . set new high production records . . . give long, trouble-free service.

For complete catalog, write to Walker-Turner Company, Inc., Plainfield, New Jersey.



Photo, upper left: **Progressive machining stages at Harley-Davidson: multiple drilling, tapping and spot facing done entirely on set-ups of Walker-Turner 20" Drill Presses.**

Photo, lower left: **Facing internal hubs of cast aluminum. Facing tools are mounted in standard Walker-Turner 20" Drill Presses.**

Photo, upper right: **20" Power Feed Drill Press Head, Model D-1101X, Hand Feed Model D-1100X. 4 ball bearings, 6" spindle travel. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Capacity 1" in cast iron, ¾" in steel. . . . . Slo-speed motor optional.**

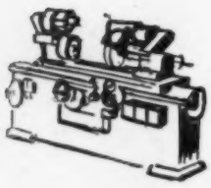
walker-turner MACHINE TOOLS

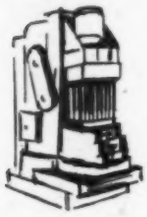
DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS
RADIAL SAWS • BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

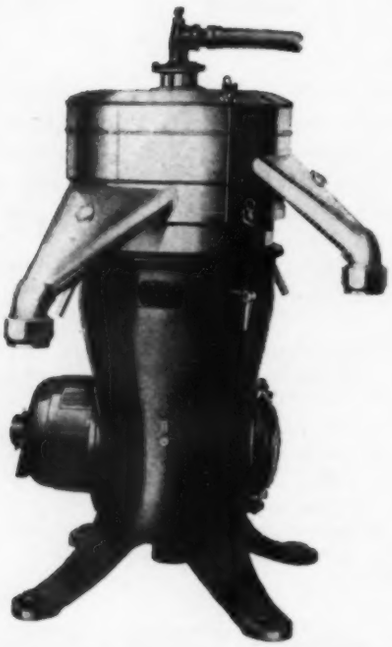
4205

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

De Laval Helps Make Every Machine Tool a BETTER PRODUCER







A De Laval Oil Purification System is an investment that will help to make every machine tool in your plant a better producer. Using centrifugal force which positively removes not only solid impurities but water as well, De Laval Oil Purifiers restore all types of factory oils to "like new" clarity and cleanliness.

In the case of cutting oil purification, for example, De Laval Oil Purifiers give you three-way production protection: **Tools cut better** because tool-dulling metallic particles are removed continuously. **Machines last longer** because harmful dirt, grit, metallic chips and water are removed from the cutting oil. **Work output rises** because uniform quality cutting oil helps to maintain uniformity in work.

No shop is too small — and none too large — to profit by installing a De Laval Oil Purification System. Write for Bulletin MM-1 for additional information.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

Save more than the oil with **DE LAVAL** PURIFIERS and CLARIFIERS FOR FACTORY OILS *Save work! Save tools! Save machines!*

CENTURY MOTORS
Deliver Dependable Power
No Matter What the Job!

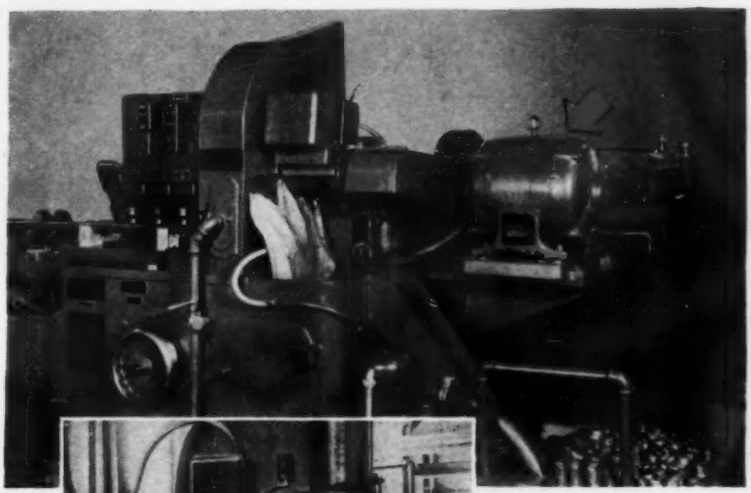
20 horsepower Century Squirrel Cage motor driving an automatic screw machine.

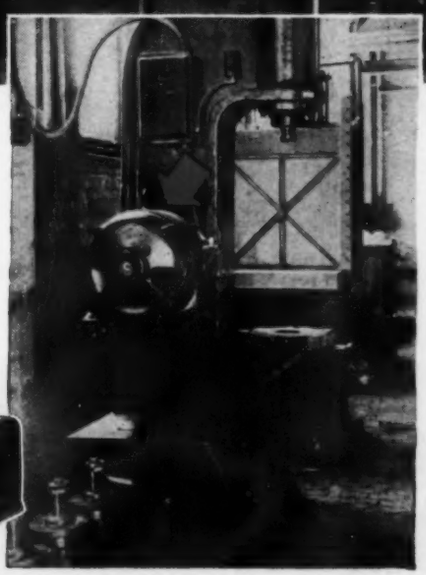
From the precision high speed production of an automatic screw machine to the rugged power of a large press, there's a Century motor with the stamina to stay on the job.

Throughout their wide range of types and sizes Century motors are ruggedly built. Rigid frames, accurately machined feet, large shafts, accurate alignments, adequate ventilation system and good mechanical and electrical balance — all contribute to their outstanding performance.

Century builds a complete line of fractional and integral horsepower electric motors, polyphase, single phase and direct current, in sizes from 1/6 to 400 horsepower to meet the requirements of industrial production, processing, commercial and appliance needs.

Specify Century motors for all your electric power requirements.





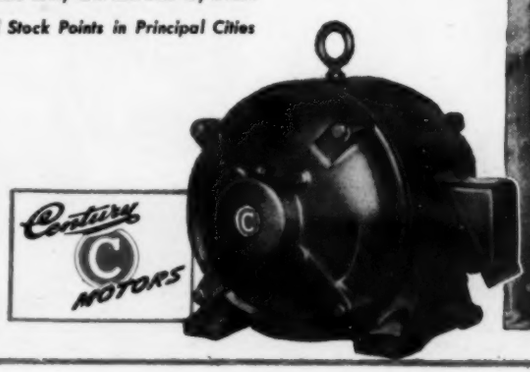
10 horsepower Century Squirrel Cage motor driving an abrasive cut-off machine.

7½ horsepower Century Squirrel Cage motor driving a pump on a hydraulic press.

Century Electric Company

1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities



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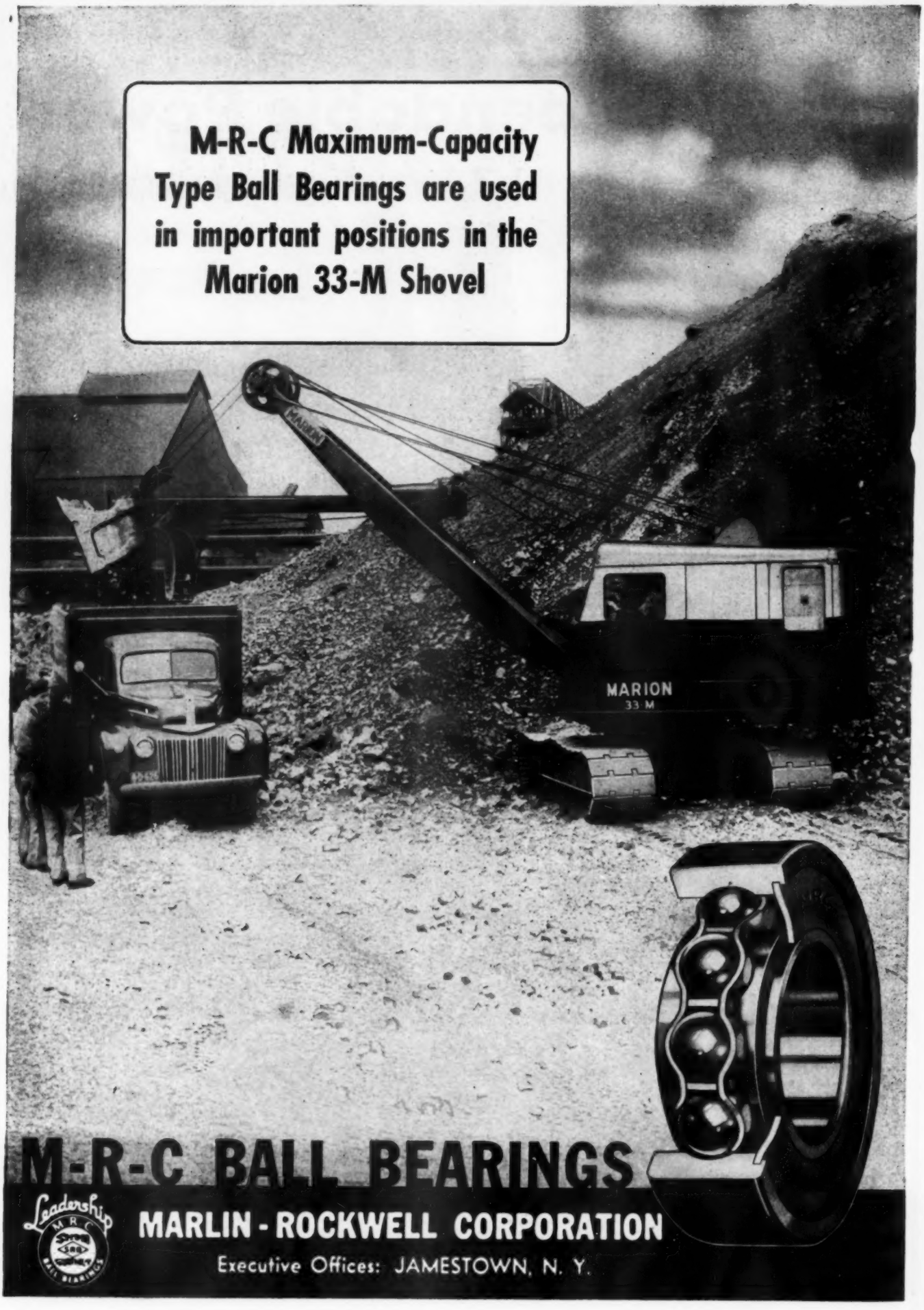
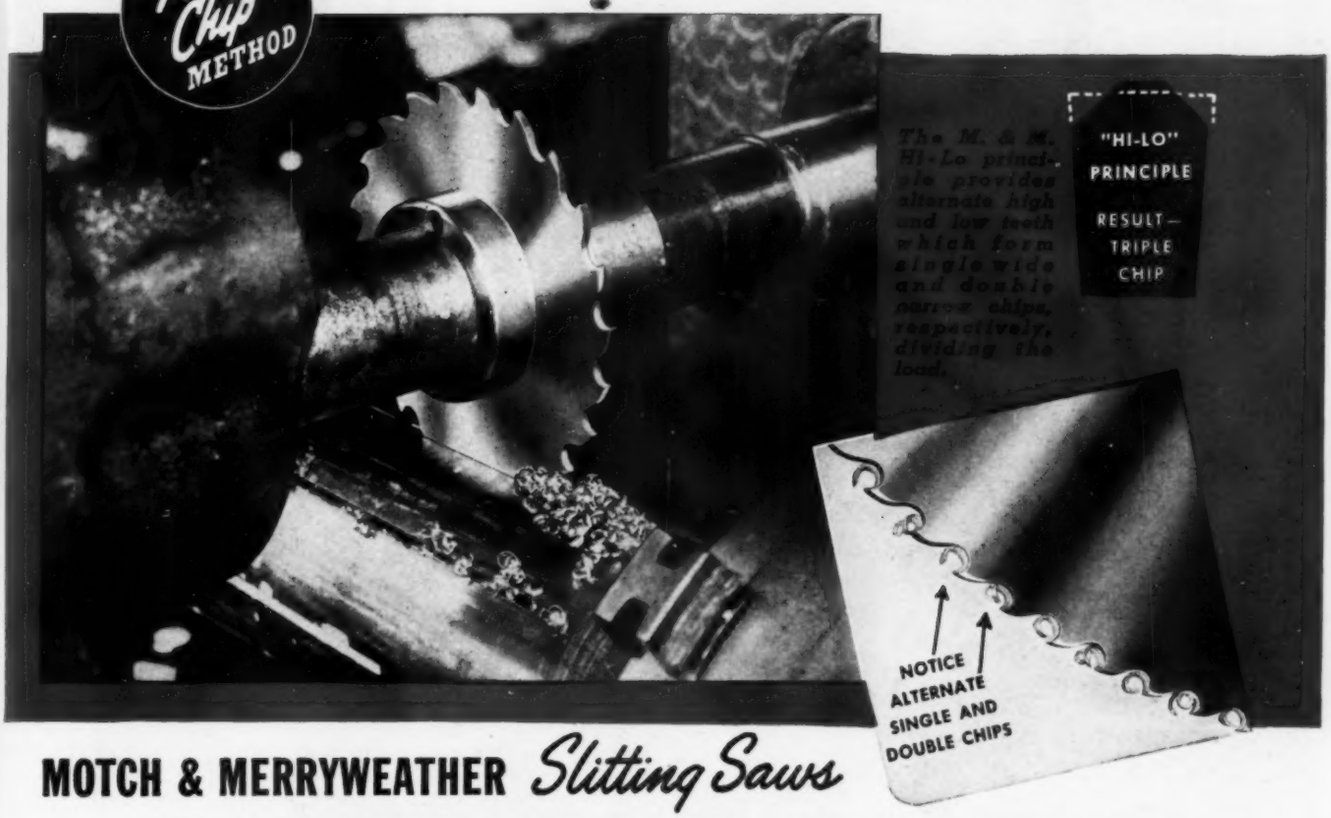

M-R-C Maximum-Capacity Type Ball Bearings are used in important positions in the Marion 33-M Shovel
MARION
33-M
M-R-C BALL BEARINGS
Leadership
MARLIN-ROCKWELL CORPORATION
Executive Offices: JAMESTOWN, N. Y.

BREAK UP *Your Chip Loads..*

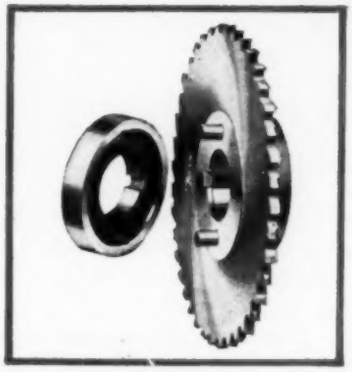
CASH IN ON FASTER FEEDS AND SPEEDS!

Triple-Chip METHOD


"HI-LO" PRINCIPLE
RESULT— TRIPLE CHIP
The M. & M. Hi-Lo principle provides alternate high and low teeth which form single wide and double narrow chips, respectively, dividing the load.
NOTICE ALTERNATE SINGLE AND DOUBLE CHIPS

MOTCH & MERRYWEATHER *Slitting Saws*

GIVE GREATER SPEEDS AND LONGER TOOL LIFE

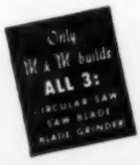


Motch & Merryweather's original dual drive equalizes stresses, gives plenty of driving power, and makes blade keyways unnecessary

M. & M. Slitting Saw Blades enable you to profit from record-breaking speeds and satisfying accuracy. They give you all the well known advantages of the Triple-Chip Method. The characteristic M. & M. curved, cam-generated tooth contour avoids clogging, since the curling chips are self-clearing. A generous gullet imparts great strength to the teeth. Result: faster cutting, longer blade service.

Exclusive dual drive design supplies positive driving power and protects the driving means; practically no blade breakage. Blades adaptable to arbors up to 1¼"; interchangeability conserves blade investment. Range of pitch in all diameters and thicknesses. Other big advantages, too.

Get well illustrated Bulletin "A-6"



THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

CUTTING TOOL DIVISION

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

DOES THIS NEW GRINDING & POLISHING UNIT GIVE YOU AN IDEA?

"Hill" 2-Roll Vertical Abrasive Belt Polishing Machine with cover removed.

HILL ACME TOOLS FOR INDUSTRY

Here is a totally new design in bar (or plate) grinding and polishing machines that may be used for an individual operation or assembled in multi-stage units for continuous finishing. "Hill" 2-Roll Vertical Abrasive Belt power driven feed or pinch roll type machines are now being used very successfully for line polishing of bars, plates or blanked shapes in the flat before forming. Typical installations at present include a line of 3 and 6 and 8 and 12 and 16 and 19 machines,—all synchronized as to feeds, speeds, etc. The proven results of this type of flat line polishing before forming has been astonishing,—both as to increased production and decreased costs. This type of equipment is offered in 6" multiple widths up to 60". "Hill" 2-Roll Abrasive Belt Grinding and Polishing Machines are also built in two other types; one for processing sheets of ferrous or non-ferrous metal, and the other for processing strip in coil form. Details will be cheerfully furnished for any of the three companion types of endless abrasive belt grinding and polishing machines for processing flat surfaces. Bulletin No. GP3

THE HILL ACME COMPANY

6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

"HILL" GRINDING AND POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

What is Your I.Q. on Kennametal?

Q. How hard is Kennametal?

A. The Rockwell A hardness of the various metal-cutting grades ranges from 90.3 to 93.1.

Q. How is hardness determined?

A. Usually with a Rockwell tester which measures the indentation made with a diamond penetrator under a 60 Kg load, and indicates the value on a calibrated dial.

Q. Is hardness an absolutely definite property?

A. No, because hardness is not a fundamental property of materials and may be defined in many ways, with different tests employed. The values obtained by methods of testing are the resultant of several properties, such as resistance to deformation, and the relative magnitude will vary greatly with the method of measuring penetration and properties of the material. The Rockwell test is, however, a convenient means of comparison.

Q. How does the hardness of Kennametal compare with that of steel?

A. The maximum for heat-treated steel is 85 Rockwell A—much less than the "softest" Kennametal grade.

Q. Does this "tell the whole story"?

A. No, because the figures do not adequately express the greater effectiveness and durability of Kennametal in use, since a few points of difference at the upper end of the Rockwell scale are more important than the numerical value indicates.

Q. What does the Rockwell test fail to show when made on Kennametal?

A. It is more a measure of the amount of binder metal present, and the state of subdivision of the carbide particles than their actual hardness, which is between that of the sapphire and diamond by scratch test.

Q. Is hardness the best measure of wear resistance?

A. No. Composition and internal structure are more important.

Q. Does hardness alone indicate the value of Kennametal?

A. No. To be mechanically useful a cemented carbide must combine hardness with strength and resistance to wear, which result from proper chemical composition and physical structure.

Q. Why do the several grades of Kennametal differ in hardness?

A. Machining requirements vary with the material to be cut, and the type of operation. For heavy cuts a stronger composition is required than for light or precision cuts, and some materials are more abrasive than others. To obtain needed strength, more binder metal is included and the composition altered, which lowers the hardness somewhat. However, even the hardest grades of Kennametal have unusual strength.

Q. How consistent is the hardness of each Kennametal composition?

A. The variation is nil within the limits of accuracy of testing methods. This holds good for tests on different areas of individual specimens, and on various specimens, of regular production.

Q. What is the significance of this hardness uniformity?

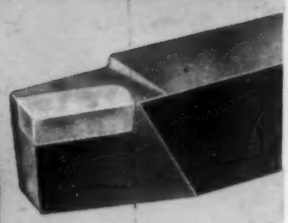
A. It has been definitely determined that consistency in hardness indicates uniformity in other distinctive properties of Kennametal, particularly high transverse rupture strength.

Q. What assures this condition?

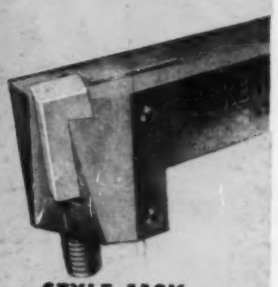
A. A sound, uniform physical structure is produced by distinctive processing throughout all stages of manufacture, and precise scientific methods of control.

6 WAYS TO SAVE by using KENNAMETAL TOOLING to Increase Output of Metal Cutting Machines

Typical KENNAMETAL TOOLS

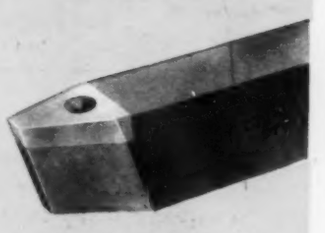


STYLE BR



STYLE 11SK

STYLE 11H



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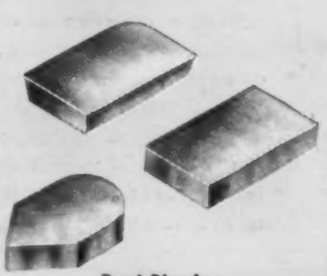


Tool Blanks
Hundreds of sizes
in all popular grades

Your machines are only as efficient as the cutting tools you use. It's good, sound judgment to invest a few extra pennies in long-lived Kennametal tools that can turn out up to five times as much as high speed steel tools on the same machine in the same time. Here's what you can gain by using Kennametal tools:

—**MACHINE TOUGHER, HARDER METALS**
Steel-cutting Kennametal tools cut steels in the hardened state; often eliminate need for annealing and rehardening.

—**INCREASE CUTTING SPEEDS UP TO 1000%**
Kennametal lets you convert electric power into cuttings or chips in the least possible time.

—**REDUCE MACHINE DOWN TIME**
Kennametal cuts within tolerance from 5 to 20 times longer; reduces machine down time required to change tools.

—**LOWER TOOL COSTS**
Durable Kennametal is the lowest-priced tool material when cost is measured in pieces per grind and pieces per tool.

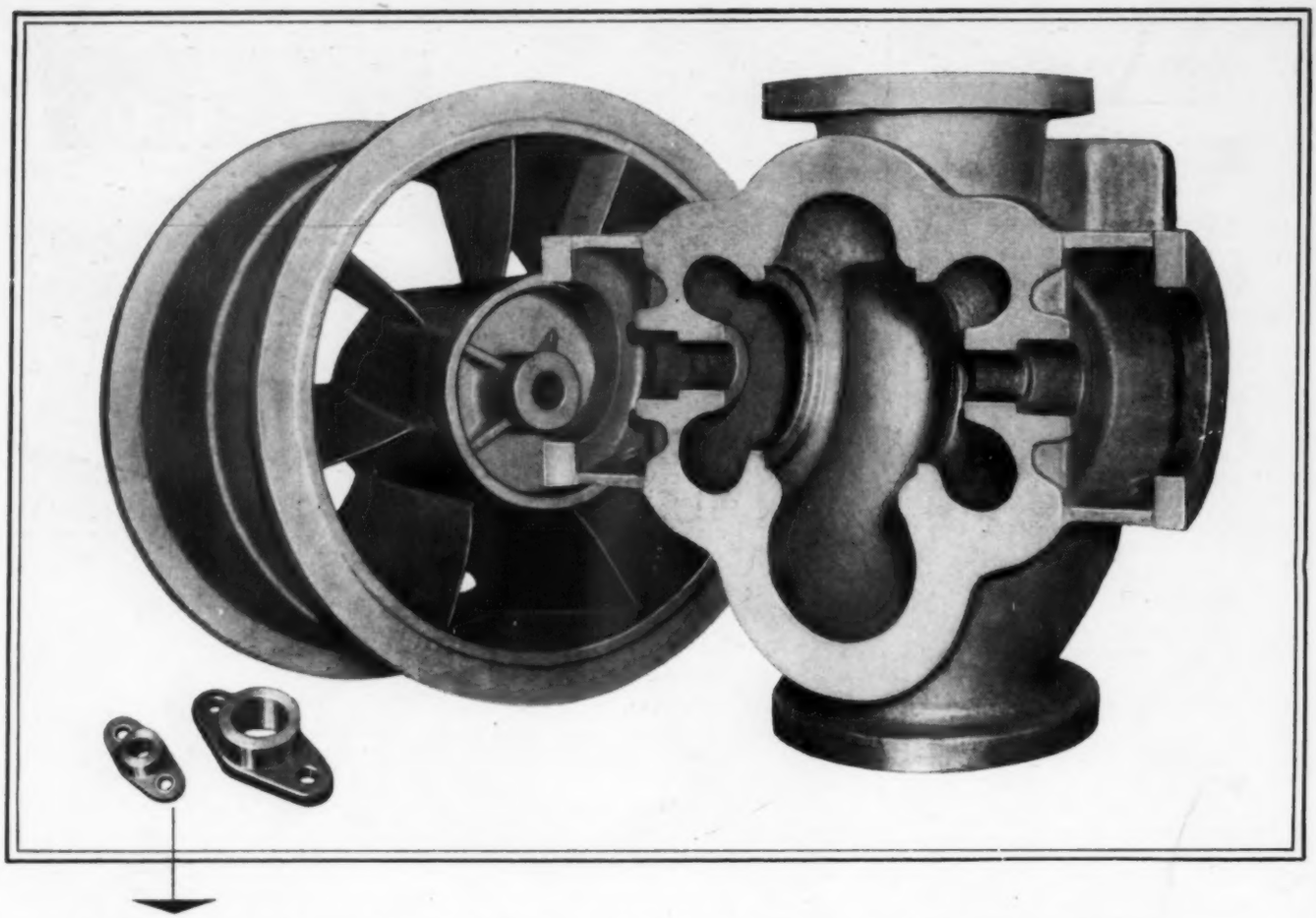
—**MINIMIZE GRINDING**
Kennametal wears longer; requires fewer trips to grinding room for sharpening. New mechanically-held tools simplify procedure—no steel to grind.

Kennametal is made in various steel-cutting grades, each containing $WTiC_2$—the distinctive ingredient that prevents excessive cratering which destroys ordinary tools; and in two cast-iron cutting grades—K6 for heavier, roughing cuts, and K8 for fine finishing and boring.

Ask our field representative to suggest the best Kennametal tooling—the right grade, the right tool—for each of your jobs.

KENNAMETAL Inc.
Latrobe, Pa.

Manufacturers of Superior Cemented Carbides and Cutting Tools That Increase Production



"Custom-Engineered" Castings — for Long Range Economy

For longer, more economical service, N-B-M non-ferrous structural castings are tailor-made to your own specific application

Seldom are two structural casting problems precisely the same. A pump housing, for instance, presents certain requirements, while an impeller may call for a completely different alloy and casting technique.

Because of these innumerable combinations, N-B-M engineers make a specialty of research and manufacturing development — an approach that in the last 74 years has built up a tremendous backlog of experience in solving the most complex problems of casting design.

The unique engineering service of National Bearing Division includes a complete study of the important factors involved in each casting application. The unvarying result of this N-B-M service is to find the answers to such problems as:

The Proper Alloy—for long, trouble-free service and increased resistance to corrosion.

The Proper Casting Design—for a high factor of strength to handle safely the projected loads, pressures and stresses.

The Proper Casting Technique—for close tolerances consistent with maximum economy and ease of finished machining operations.

Any successful application of a structural part—large or small — depends on the correct solution to these basic problems of design. Let the specialized approach and broad experience of National Bearing Division find the right answers for you.

N·B·M

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION

ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

Less Down-Time . . . Lower Costs

ON THE WORLD'S FASTEST PRODUCTION LINES!

DEFIANCE

PRODUCTION DRILLS

Designed to meet production requirements of one of the nation's largest automotive plants, Defiance Production Drilling Machines are built with *extra ruggedness* that means *less down-time . . . lower costs!* They're time-proven . . . for 18 years in high production work. *Extra dependability* in these Defiance features . . . anti-friction bearings on spindle and all speed shafts . . . alloy steel spindles and gears . . . wide choice of feeds and speeds . . . quickly adaptable to changes in production when needed . . . unbeatable for long-life low-cost operation on the production line.

MANY USES

Nearly 1000 Defiance Production Drilling Machines now serving industry in uses that include—

—*Automobile Plants* for single spindle drilling, reaming and tapping as well as multiple spindle work with special heads. Operations are on axle parts, gears, steering arms, differential case and cover, etc.

—*Diesel Engine Plants* for counterboring operation on cylinder bores and multiple spindle head operations on parts.

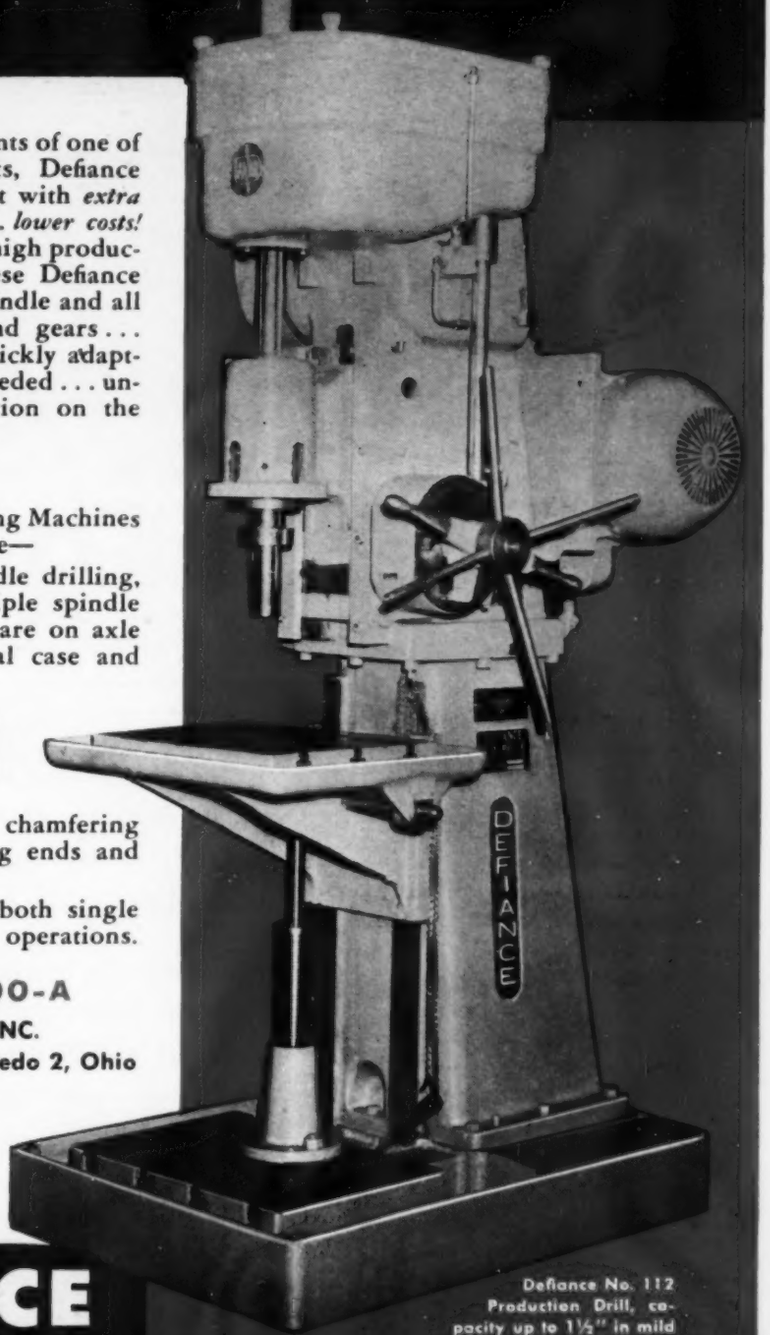
—*Refrigeration Manufacturers* for chamfering operation on cylinder bores, for facing ends and finish boring the bearing bosses, etc.

—*Machine Parts Manufacturers* for both single spindle and multiple spindle drilling operations.

WRITE FOR BULLETIN 100-A

DEFIANCE MACHINE WORKS, INC.

2325 Madison Ave. **Toledo 2, Ohio**

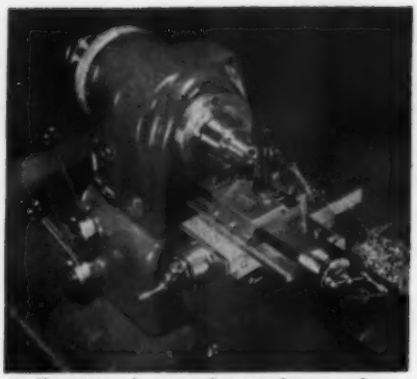


Defiance No. 112 Production Drill, capacity up to 1½" in mild steel; also available No. 200, capacity up to 2" in mild steel.

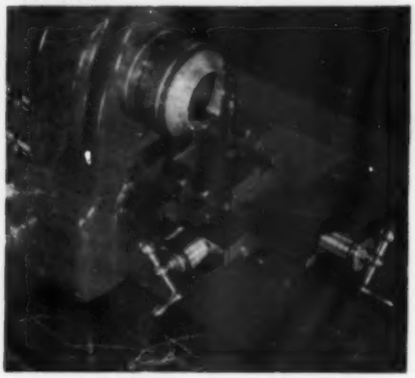
98 YEARS OF PRECISION MANUFACTURING

DEFIANCE

BORING . . . MILLING . . . DRILLING . . . TAPPING MACHINES

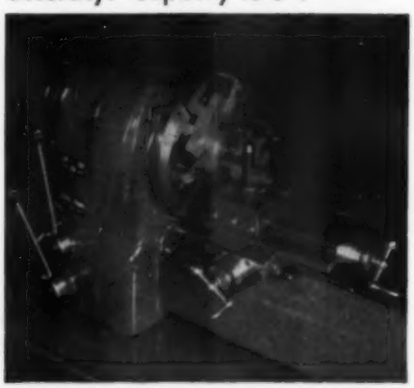


Collet Work — The right machine for collet work of one-inch or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".

Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".



Face Plate Work — 9" slotted and tapped face plate for holding irregular shapes.

HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

Correct Size - High Speed - Precision Results

SPECIFICATIONS:
1" Collet Capacity
9" Swing
17" Center Distance
8 Speeds to 4000 rpm.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results.

Send for Free illustrated Bulletin DV 59

HARDINGE BROTHERS, INC., Elmira, N. Y.

Offices in Principal Cities. Export Office: 269 Lafayette St., New York 12, N. Y.

The signing of the Declaration of Independence of the United States of America, July 4, 1776.

Good Judgement PAYS OFF!

Yes, good judgement paid dividends then . . . it will pay *you* dividends *now* when you select Bay State wheels for your grinding needs. This "good judgement" selection will give you consistently higher performance in countless everyday grinding jobs.

Here's why BAY STATE INTERNAL WHEELS are so widely used throughout industry today:

1. Take heavy, fast cuts.
2. Have exceptionally long life.
3. Are uniform in size and grinding action.
4. Are accurately centered . . . arbor holes parallel to face.
5. Afford consistent duplication, assuring uniform results.
6. Feature Bay State's exclusive fractional grades . . . three degrees of hardness in a single normal grade.

You will find Bay State's Operational and Specifications folder of real value. Write for it today.

Branch offices & warehouses Chicago — Detroit
Distributors — All principal cities

BAY STATE®

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASSACHUSETTS, U. S. A.

Feeling the Step-up

In Light Metals Finishing?

Monel
Dural
Aluminum
Stainless Steel

Increasing demands and new-procedure requirements in finishing light metals are being met every day by cost-cutting, profit-building, product-improving Brightboy.

Results are obtained through Brightboy's one-operation precision action, which burrs, finishes and polishes to close tolerances, and at the same time achieves unusual surface effects where required.

Not until you see these results can you visualize the versatility and the savings which Brightboy's rubber and abrasive combination produces. Ask your distributor for the Brightboy catalog-manual and prices; write the Brightboy service department on specific production problems.

WHEELS • BLOCKS • STICKS • RODS

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co.
Newark 7, N. J.

WELDON ROBERTS
Brightboy

BURRING • FINISHING • POLISHING
IN ONE OPERATION

The *SOFT RUBBER* binder *CUSHIONS* the abrasive

Your Source of Supply for Better Taps

There are many sources of supply for standard taps . . . also varied degrees of quality in manufacture. The only way to determine *your* best source is by (1) reputation of the manufacturer in the trade, (2) your on-the-job performance of the taps you buy on the basis of tapping cost per hole.

However, if you run into troubles, it is far better practice to consult *your* manufacturer, stating the trouble in detail and requesting a solution. Hanson-Whitney engineers welcome such inquiries . . . in fact, we request them. We stand firmly back of Hanson "Finished Taps" of both Standard and Special make.

And as for "Specials," you'll find no *better* source of supply anywhere.

Measurement of Tapping Costs

Economy of tapping is measured only by the cost per tapped hole . . . not by the cost of the taps themselves.

In high speed tapping the Hanson-Whitney "Finished Taps" clearly demonstrate their superior value both for accuracy and economy. The accuracy with which they are made results in long tap life, minimum breakage, and perfect threads. It naturally follows that they are the most economical to use.

Explain Your Job in Detail . . . We'll Serve You Better

When ordering, specify grade of material to be tapped, depth of tapped hole, class of fit and whether through hole or bottoming. With full information we can give you correct hook or rake on cutting faces, number and style of flutes and proper chamfer. Thus you obtain the right tap for the specific operation . . . lower costs, quality threads.

4HW48 ADVERTISEMENT

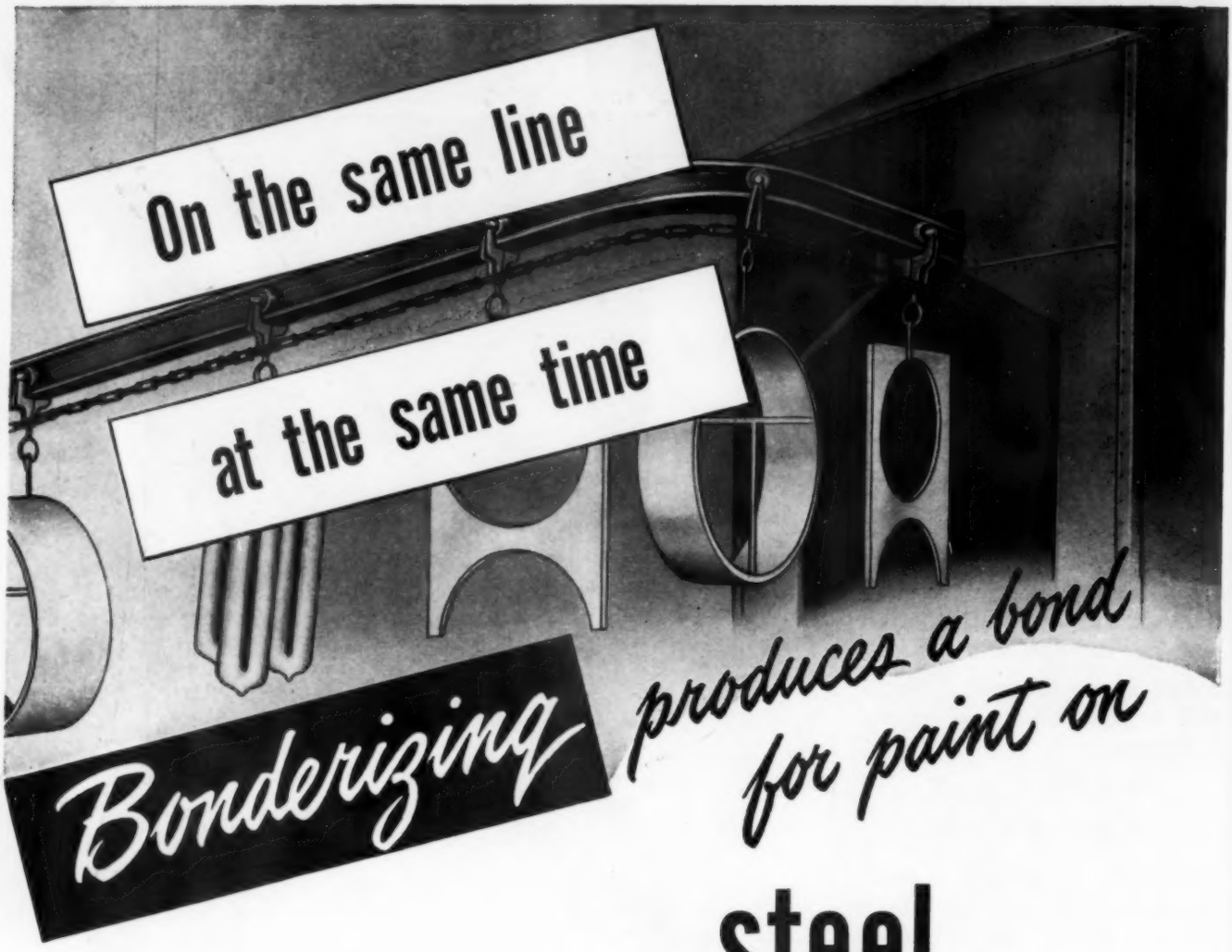
If your tapping problem involves bottoming holes . . . or deep holes . . . the solution may be in the use of a Hanson-Whitney spiral flute tap that is most effective when made by the Hanson-Whitney method, and with the Hanson-Whitney background of "ground after hardening" experience.

The spiral flute tap, made with flutes and threads of the same hand, draws the chips *from* the hole. This prevents chip clogging and provides free flow of coolant.

HANSON-WHITNEY MACHINE CO. HARTFORD 1, CONN.
Division of Whitney-Hanson Industries, Inc.

For practical recommendations submit your problems to Hanson-Whitney engineers.

Hanson Whitney
PIONEERS OF FINISHED TAPS



steel zinc aluminum

Developed especially for manufacturers with mixed metal production, the Bonderizing process produces a paint-holding, protective Bonderite coating on steel, zinc, and aluminum simultaneously.

No need now to separate these metals on the finish line. Steel, zinc, aluminum – and their alloys – can travel a single conveyor line from cleaner to paint booth. Quickly, simply, economically, and with equal effectiveness, the Spra-Bonderite process converts these metal surfaces to the characteristic nonmetallic phosphate coating of paint-holding, corrosion-resistant Bonderite.

Now, *all* the parts of your product – whether made of aluminum, steel, zinc, or alloys of these metals—can have the lasting benefits of Bonderizing under the paint finish!

Learn how this process can add longer lasting fine finish and appearance to your product. Write today for full information on Bonderizing for Mixed Production.

Bonderite, Parco, Parco Lubrite – Reg. U. S. Pat. Off.

PARKER

PARKER RUST PROOF COMPANY
2196 East Milwaukee Ave.
Detroit 11, Michigan

BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces

Announcing the New Airco 700 Welding Torch

The Airco 700 is easily converted to handle general shop cutting work by the addition of a cutting attachment.

. . . DESIGNED TO HANDLE 90% OF YOUR WELDING AND BRAZING JOBS

Before designing the new Airco 700 Torch, we asked shop operators and welders what features they wanted in a welding torch. The new "700" incorporates their recommendations and those produced by Airco research engineers. Salient features are:

Wide Operating Range . . . The Airco 700 Torch is available with a wide selection of tips for use on almost any welding job from thin sheet metal up to two inch plate. Equipped with a multi-flame tip, it is unbeatable for silver and aluminum brazing.

Better Flame Control . . . The Airco 700 Torch is available with tip assemblies which range from Nos. 00 thru 10. Each welding tip is assembled with a mixer drilled for that particular size of tip. This means finer flame control . . . there is no sputtering —better welds result.

Low Maintenance Costs . . . The Airco 700 Torch has a head of durable, long-wearing monel metal. This means fewer replacements and also lower maintenance costs because rarely is reseating required.

Perfect Balance . . . The Airco 700 Torch (with a No. 5 tip) weighs only 19½ ounces and is 16½ inches in length. Equipped with 3/16" I.D. hose, the "700" eliminates heavy hose drag, and reduces operator fatigue.

For heavier jobs, Airco also has available a Series 800 Torch which is comparable to the "700" in both appearance and operating characteristics.

If you would like to have either the "700" or "800" demonstrated in your shop . . . or if you desire more information about these torches, address Dept. AM-8414, Air Reduction, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas. On West Coast: Air Reduction Pacific Company, San Francisco 4, Calif.

AIRCO

AIR REDUCTION

Offices in all principal cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

Staples SETS A RECORD LOW In Carbide Reamer Prices

Announcing ECONOCUT

CARBOLOY-TIPPED CEMENTED CARBIDES REAMERS

Again, Staples Tool Company leads in reducing *metal cutting costs*—with the new line of ECONOCUT Reamers. These precision Carboloy-tipped tools are now available for immediate delivery at the *lowest prices ever announced* in circular carbide tool history!

Now you get carbide reamer economy, better hole finish, longer tool life—at greatly reduced prices. Staples has made this cost reduction possible through expanded and improved production facilities —and by standardizing ECONOCUT on straight shank tools in the most widely used size range. See your Staples Tool Distributor, or write for further information.

STRAIGHT SHANK—STRAIGHT FLUTES				
Diameter	Number of Flutes	Shank Diameter	Overall Length	PRICE
1/4"	4	15/64"	6"	$3.75
9/32	4	15/64	6	4.00
5/16	4	9/32	6	4.00
11/32	4	9/32	6	4.25
3/8	4	5/16	7	4.25
13/32	4	5/16	7	4.75
7/16	4	3/8	7	4.75
15/32	4	3/8	7	5.00
1/2	6	7/16	8	5.50
17/32	6	7/16	8	5.75
9/16	6	7/16	8	5.75
19/32	6	7/16	8	6.25
5/8	6	9/16	9	6.25

NOTE: For taper shank requirements, use standard split sleeve reamer driver. Available at moderate price.

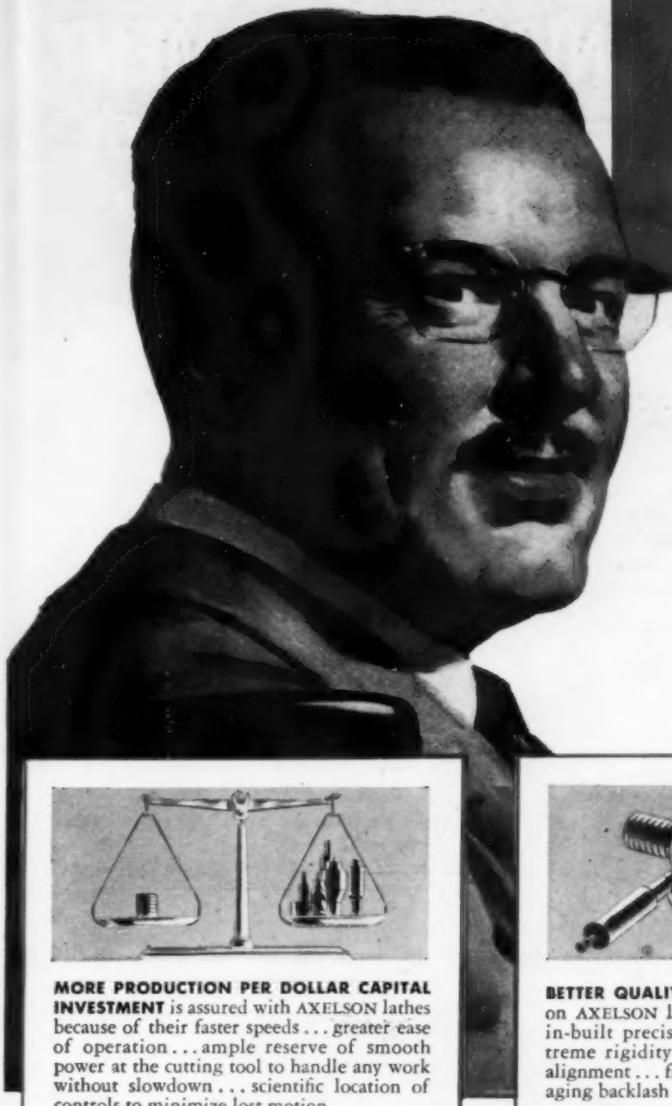
THE STAPLES TOOL COMPANY
CINCINNATI 25, OHIO

write for your complete Staples Tool catalog

Staples CARBOLOY CEMENTED CARBIDE TOOLS

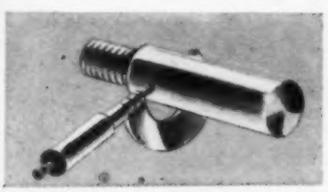
A COMPLETE LINE OF SINGLE AND MULTIPLE POINT CUTTING TOOLS
EXPANSION REAMERS • FORM TOOLS • CENTERS • MASONRY DRILLS • SPECIAL TOOLS

AXELSON FIRST CHOICE

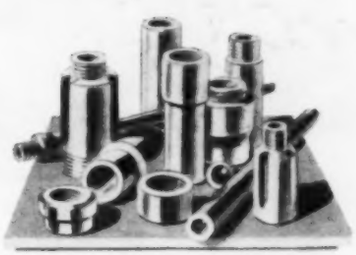


MANAGEMENT EXECUTIVES AGREE a greater volume of production per man-hour and better quality work at less unit cost, is produced in their machine shops on AXELSON heavy-duty engine lathes.

MORE PRODUCTION PER DOLLAR CAPITAL INVESTMENT is assured with AXELSON lathes because of their faster speeds . . . greater ease of operation . . . ample reserve of smooth power at the cutting tool to handle any work without slowdown . . . scientific location of controls to minimize lost motion.

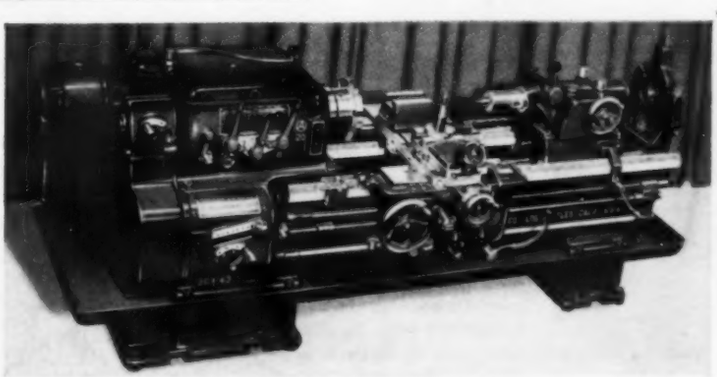


BETTER QUALITY WORK is produced on AXELSON lathes because of their in-built precisioned accuracy . . . extreme rigidity to maintain positive alignment . . . freedom from tool-damaging backlash and chatter.



WIDER RANGE OF APPLICATIONS means fewer machine tools needed to handle the work load . . . two-speed tailstock . . . built-in reverse clutch . . . designed for modern high-speed and carbide-tipped tooling.

LONGER LIFE—LESS MAINTENANCE with AXELSON lathes, cut depreciation and plant overhead . . . reduce to a minimum production shutdowns for maintenance or repair . . . provide years of added precision work at no replacement cost.



THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON *Lathes*

DEPENDABLE FOR A THIRD OF A CENTURY

AXELSON MANUFACTURING CO.

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AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL INDUSTRIAL CENTERS

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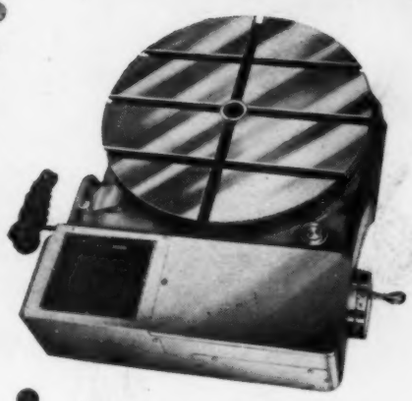
KNIGHT EQUIPMENT
. . to Boost Output and Lower Costs

No. 50 PRECISION BORING AND VERTICAL MILLING MACHINE

Adaptable to an extreme variety of difficult jobs. Eliminates work transfers, reduces set-up time to a minimum. Combines advantages of both a solid base precision boring machine and rigid vertical miller. Unusual capacity. Fast and simple operation.

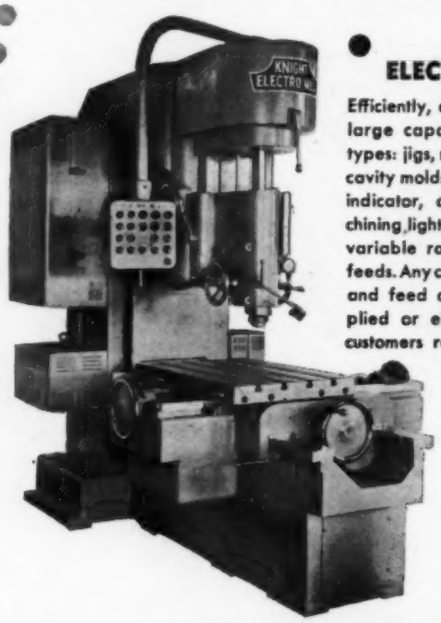


20" ROTARY TABLE

A self-contained motor-driven unit which adapts any milling machine for rotary milling or indexing. Eliminates set-up time. No installation — just plug into electric outlet. 18 Feed changes, 1½" to 54" or 3" to 108" per minute.

HOLE GRINDING ATTACHMENT

Accurately and quickly finishes holes and bores up to 6" diameter in hardened parts. Simplifies handling work too large to swing in standard machines. Special adaptors permit easy installation on any milling machine.



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Efficiently, economically handles large capacity work of many types: jigs, metal patterns, multi-cavity molds, jig boring with dial indicator, drilling, milling, machining light metals, etc. Infinitely variable range of speeds and feeds. Any combination of speeds and feed controls can be supplied or eliminated subject to customers requirements.

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KNIGHT VERSATILE MILLERS ACCURATE RIGID

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MACHINERY COMPANY

MORE GOODS for MORE PEOPLE at LOWER COST

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GROUND FROM THE SOLID
BATH
TRADE MARK
JOHN BATH CO.

IT TAKES SOMETHING EXTRA TO BE A *Specialist!*

You've got to be *good* to stay in the big league . . . but you've got to have something "extra" to be a standout! Just as it takes extra training and perfect technique to slide safe into home plate, so it has taken years of experience to build an accepted reputation for BATH ground thread taps . . . a *standout* for quality, wear and precision machining.

The experienced technique of our craftsmen assures the dependable manufacture of BATH taps—from the toughening of uniform structure steel by proper hardening and tempering to the final step where the taps are *ground from the solid*, in stock and special sizes—ready for rigid inspection.

For tougher, longer lasting taps, insist on the name BATH on the tap shank . . . your guarantee of efficient production! See your BATH representative or write direct about your tap problems.

(Transportation is paid to your plant on all Bath products)

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22 Grafton Street
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GROUND THREAD TAPS • PLUG AND RING THREAD GAGES • INTERNAL MICROMETERS

Wanted...a Compass

THE world gropes for a road to peace and security. It expects help and guidance from America--a compass to show the true way.

America *has* a true compass. It is our concept of freedom for the individual. Personal liberty has made us the envy and hope of the peoples of the earth. *You, as a community leader,* have a duty to marshall public opinion to guard and strengthen this priceless heritage that built our nation.

Only through the wise, courageous effort of community leaders can we keep America the impregnable home of liberty and freedom, and reach a lasting world peace founded on right and justice.

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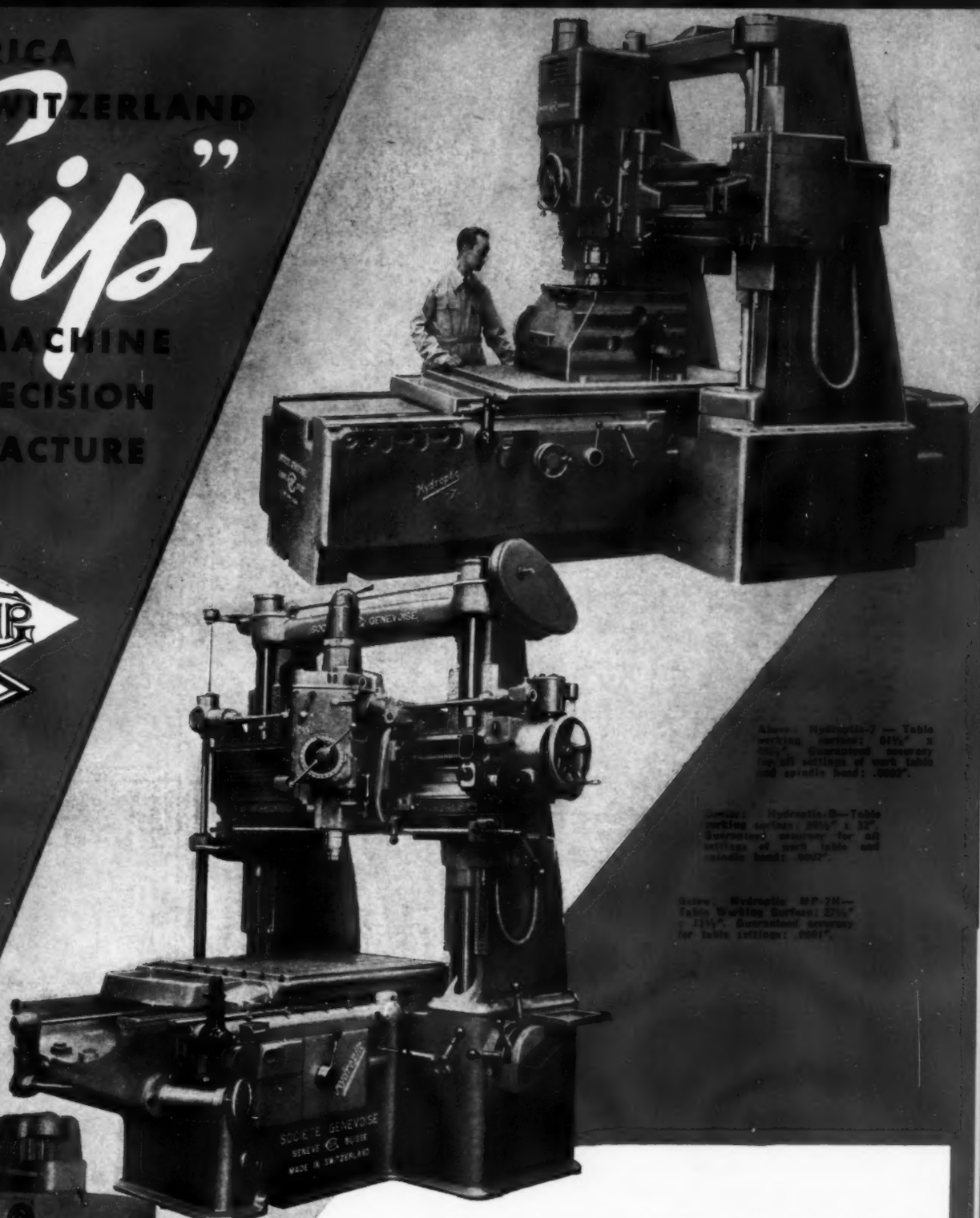
MANUFACTURERS OF CARBON, ALLOY AND YOLOY STEELS

COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - TIE PLATES AND SPIKES - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS.

IN AMERICA
AS IN SWITZERLAND

"Sip"

IS the MACHINE
FOR PRECISION
MANUFACTURE



Above: Hydrostatic-7 — Table working surface: 61½" x 25½". Guaranteed accuracy for all settings of work table and spindle head: .0002".

Below: Hydrostatic-B—Table working surface: 39½" x 22". Guaranteed accuracy for all settings of work table and spindle head: .0002".

Below: Hydrostatic BP-24—Table working surface: 27½" x 13½". Guaranteed accuracy for table settings: .0001".

Cosa engineers can recommend the correct SIP Jig Borer to bring the utmost accuracy and capacity to your range of work. Each machine illustrated is equipped with the famed SIP measuring system, using standard scales graduated to .00005" and read by built-in microscopes. The entire system is free from wear and mechanical stress, and assures absolute uniformity of measuring and machining. Write for complete mechanical specifications and performance data.

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Vitrified Wheels

VITRIFIED

. . . for

intricate precision grinding or coarse heavy work

Inasmuch as Vitrified manufactures a complete line of Grinding Wheels in numerous grades, grain combinations and bondings, it is merely a matter of selecting the right wheel for the work to be handled.

Because of this wide selection, a Vitrified Wheel can be depended on for economy, speed and long life in the specific service for which it is intended.

Whether your work involves roughing, finishing, surfacing, edging, or cleaning, hand, automatic or swing grinding, there is a Vitrified Wheel which will give you maximum service at minimum cost.

Why not call in a Vitrified representative to show you how you can make worthwhile saving in your grinding operations?

VITRIFIED WHEEL CO., WESTFIELD, MASS.

WHEN THE PUMP MUST BE DRIVEN FROM A REVERSING SHAFT

This TUTHILL Automatic Reversing Pump is the Answer

Tuthill Automatic Reversing pumps deliver from the same port regardless of direction of shaft rotation — and without the use of check valves. They are ideal for lubrication, coolant and liquid transfer service. Capacities up to 200 g.p.m. in wide pressure ranges. Write for Tuthill Model R bulletin.

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BAUMBACH *The DIE SET AUTHORITY*

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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Multiple Spindle Drilling and Tapping Machines — Automatic Drilling and Tapping Units — Multiple Spindle Attachable Drill Heads — Hot and Cold Swaging Machines — Hammering Machines — Tools, Jigs & Fixtures — Contract Work — Special Machinery

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Maximum Gripping Power with Extreme Accuracy and Long Life
Write for Catalog
T. R. ALMOND MFG. CO.
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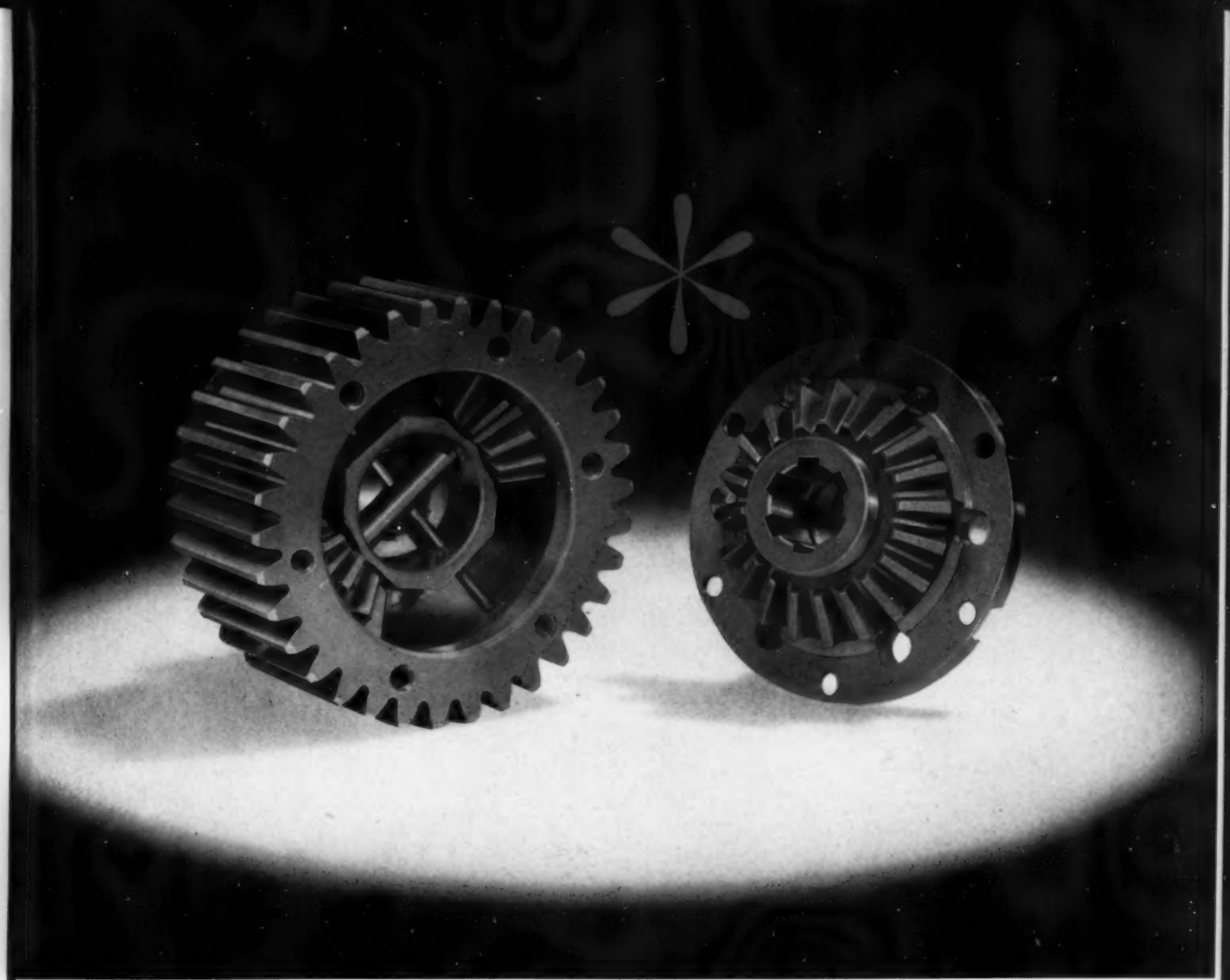

* UNIQUE—*in more ways than one!*

All credit for the design of this spur gear differential goes to the customer for whom we make and assemble this unit. It combines the function of differential, case, and final transmission drive. The customer's idea—and an exceptionally good one.

But it's unique in another way as well. You'll admit that this gear application is non-conventional. Yet its manufacture, thanks to Double Diamond methods, has been reduced to simple production techniques. As a consequence, these assemblies flow through the plant as smoothly—as predictably—as the more conventional gears required by many other customers. By keeping ourselves "geared" to do the unusual we apply our experience and facilities to the manufacture of exceptionally fine gears built to the precise requirements dictated by your needs.

Whether your gear problem is simple or complex, bring it to Automotive Gear. If you have engineered it, well and good. If you haven't, our engineering staff may be able to help you. In any case you will get gears that are as good as we know how to build them.

DOUBLE DIAMOND TRADE MARK GEARS

Automotive Gear Works, Inc.
RICHMOND, INDIANA

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FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

—AND HERE'S ANOTHER "FIRST" BY DODGE!

Here is another Dodge development which simplifies and improves power transmission machinery... the Rolling Grip Clutch. Toggles are *eliminated* by employment of ball and wedge principle.

Heavy power-transmitting pressure on the friction disc is developed by a circle of hardened steel balls which are forced into a wedge-shaped groove by the sliding cam.

The "wedge" of cam and groove contours multiplies the force exerted on the shifter collar into a powerful force on the friction disc.

Engagement is easy and positive —smooth as a rolling ball. Great flexibility, ease of control and extreme ruggedness are provided in this modern, compact unit.

Available in Bolted Plate or Gear Tooth Plate series—in sizes from .38 H.P. to 21.2 H.P. at 100 R.P.M. Write for special bulletin, A282.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana

ROLLING GRIP CLUTCH

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER

He is your local Dodge Distributor—factory trained—qualified to suggest ways to improve your machine performance, increase production. Look for his name under "Power Transmission Equipment" in your classified phone book.

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NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
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CASE 1062 -- MAINTAINING LUBE FILM ON HEAVY-DUTY GEARS.

HOIST GEAR UNIT FOR OVERHEAD CRANE

Viscous and tacky Calol Vistac Oils stuck tight under extreme pressures on hoist gears. Efficient for all heavy-duty gears, like industrial reduction sets. Come in six grades, 9X (SAE 10) to 45X (SAE 40). Apply by forced-feed or gravity lubricators, bottle- or wick-oilers.

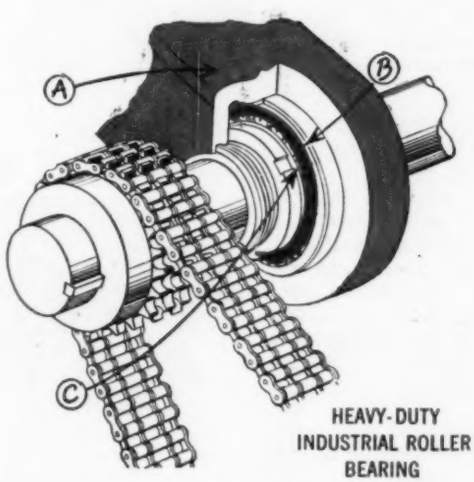
A. Contain oiliness and extreme-pressure compounds. Tough film won't rupture, even on slow-moving gears with extreme pressures on wide area for long time.

B. Economical - little required to provide adequate lubrication and dissipate heat. Resist highest operating temperatures.

C. High affinity for metal maintains lubricating film, reduces power loss and wear.

Calol Vistac Oils also recommended for lubrication of air hammers, rock drills and other air-powered tools ... atomize quickly and stay fluid at low temperatures.

CASE 1047A--KEEPING GREASE IN BEARINGS WHERE TEMPERATURES AND PRESSURES ARE EXTREME.



HEAVY-DUTY INDUSTRIAL ROLLER BEARING

When the temperature in a heavy-duty industrial anti-friction bearing reached more than 200° F., Calol E. P. Roller Grease provided adequate lubrication. Was originally developed for roll neck bearings in steel mills. Handles easily in pressure systems in all operating temperatures.

A. Resists extreme heat in housing caused by high ambient temperatures.

B. Contains extreme-pressure additives. Lubricating film will not squeeze off under the heaviest loads.

C. Highly water-resistant ... melts slowly and feeds evenly ... creeps into small clearances.

Calol E. P. Roller Grease will not corrode bearing metals and is specially made to meet heat and pressures too high for conventional anti-friction-bearing greases.

For additional information and the name of your nearest Distributor, write

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STAR

MAKES IT!

For the right saw for any given job, see the man who sells STAR Blades! Star makes blades for cutting everything a hack saw or band saw can cut – a *complete* line. Be sure! Tell your Star supplier the job you want to do. He'll tell you – quickly, expertly – what STAR Blade will do it best!

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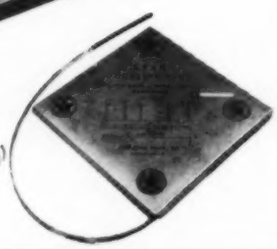
Answers blade questions for you as they arise: what speed to use ... coarse teeth or fine ... what causes dulling ... blade lengths ... prices.
Ask your Star supplier for your copy of "Metal Cutting." Helpful ... free.

★ **HAND BLADES**

★ **POWER BLADES**

★ **FRAMES**

★ **BAND SAWS**
(including skip-tooth)
(metal and wood cutting)



TRADE MARK

CLEMSON

CLEMSON BROS., Inc., Middletown, N.Y.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson L-17 lawn machine

A PLUS FACTOR
to consider in selecting PUMPS

Hundreds of pumps like these are in continuous operation in our own plant ... under the watchful eyes of skilled machine operators, maintenance men, machine designers and engineers as well as pump specialists. Hundreds more are being installed on our new machine tools. Such installations provide practical, first-hand experience for determining the desirable characteristics that pumps require to give *you* satisfactory performance.

FOR COOLANT, GENERAL CIRCULATION AND LOW PRESSURE HYDRAULIC SERVICE, these pumps offer quiet, smooth performance at high speeds. Renewable iron bearings. Mechanical seal ... prevents leakage and eliminates gland adjustments. Furnished with or without integral relief valves.

Nos. 1S, 2S, and 3S
ROTARY GEARED PUMPS
with helical gears

FOR HYDRAULIC INSTALLATIONS—to supply oil under pressure. Extremely accurate helical gears run quietly at motor speeds. Although designed for direct drives, can be pulley or gear driven. Mechanical seal. Capacity, G.P.M. at 0 lbs. pressure: No. 53 — 4 to 23.3; No. 55 — 9 to 34.1.

Nos. 53 and 55
ROTARY GEARED PUMPS
with roller bearings and helical gears

Write for catalog of complete pump line with detailed specifications and performance charts. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN

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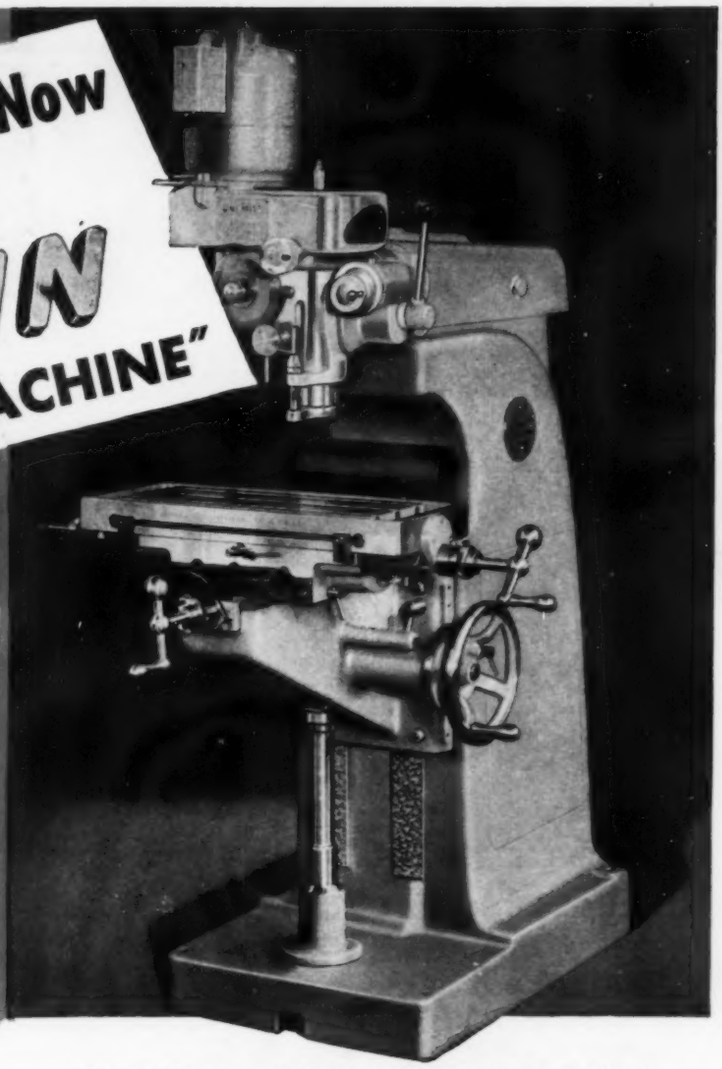
PUMPS

"Get Complete Details Now on the New GORTON ALL-PURPOSE MACHINE"



ANNOUNCING THE NEW 0-16A SUPER-SPEED MILLING MACHINE

(with Swivel or Universal Head)

Indispensable in the Tool Room and Machine Shop . . . Adaptable for General Engraving, Brass Routing, Die and Mold Duplicating

This new 0-16A *Gorton Super-Speed mill incorporates all of the features necessary in an "all purpose" machine. It will do a better job for you on any work within the limits of its size.

The Gorton 0-16A is *rugged.* It is designed for operator convenience and features extremely sensitive table and saddle controls. Spindle speeds from 300 to 10,000 R.P.M. available ½ H.P. motor.

*Trade Mark Reg. U. S. Pat. Office

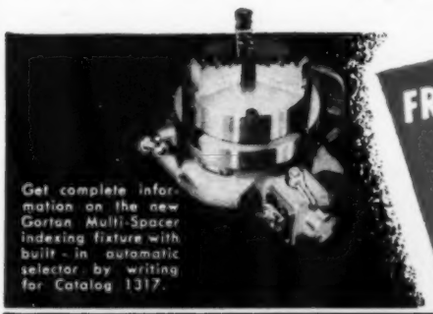
DESIGNED FOR VERSATILE DUTY— Check These Features

Heavy column, adjustable ram, super-speed spindle permanently lubricated, swivel or universal head. positive spindle brake, spindle lock, quill lock, depth stop graduated in thousandths, micrometer and lever feed on spindle.

Adaptable for . . .

. . . General engraving and brass routing by using special extension spindle and foot treadle attachments.

. . . Die and mold duplicating by adding tracer head and duplicator table.



Get complete information on the new Gorton Multi-Spacer indexing fixture with built-in automatic selector by writing for Catalog 1317.

FREE all the facts FREE

On the new 0-16A *Gorton Super-Speed Swivel Head-Universal Head Mill . . . use this coupon or write for Bulletin No. 1506-1301 No obligation, of course.

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GEORGE GORTON MACHINE CO.

Tracer Controlled Milling

1506 RACINE STREET • RACINE, WISCONSIN, U. S. A.

OUT OUR WAY

SO YOU FERGOT TO PUT DOWN SOL-SPEEDI-DRI, EH? MEBBE IF YOU BREAK A LEG, OR YOUR NECK, OR SUMPIN, YOU'LL REMEMBER! JEST LISTEN TO SOME OF TH' OLD-TIMERS AROUND HERE-- THEY'LL TELL YOU IT AIN'T HEALTHY TO FERGET TO PUT DOWN SOL-SPEEDI-DRI!
THAT KID BETTER KEEP ON HIS TOES! BUT BEFORE HE CAN DO THAT, HE'S GOTTA PUT DOWN SOL-SPEEDI-DRI SO HE CAN KEEP ON HIS FEET!
REMEMBERIN' AIN'T ENOUGH! IT'S REMEMBERIN' NOT TO FERGET THAT'S IMPORTANT!
J.R.WILLIAMS
THE LECTURE
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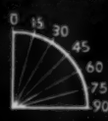

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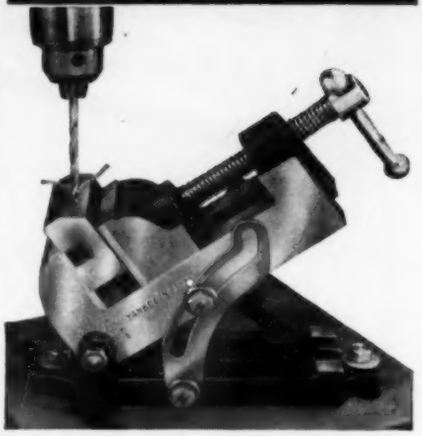

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BUT ALSO A BETTER
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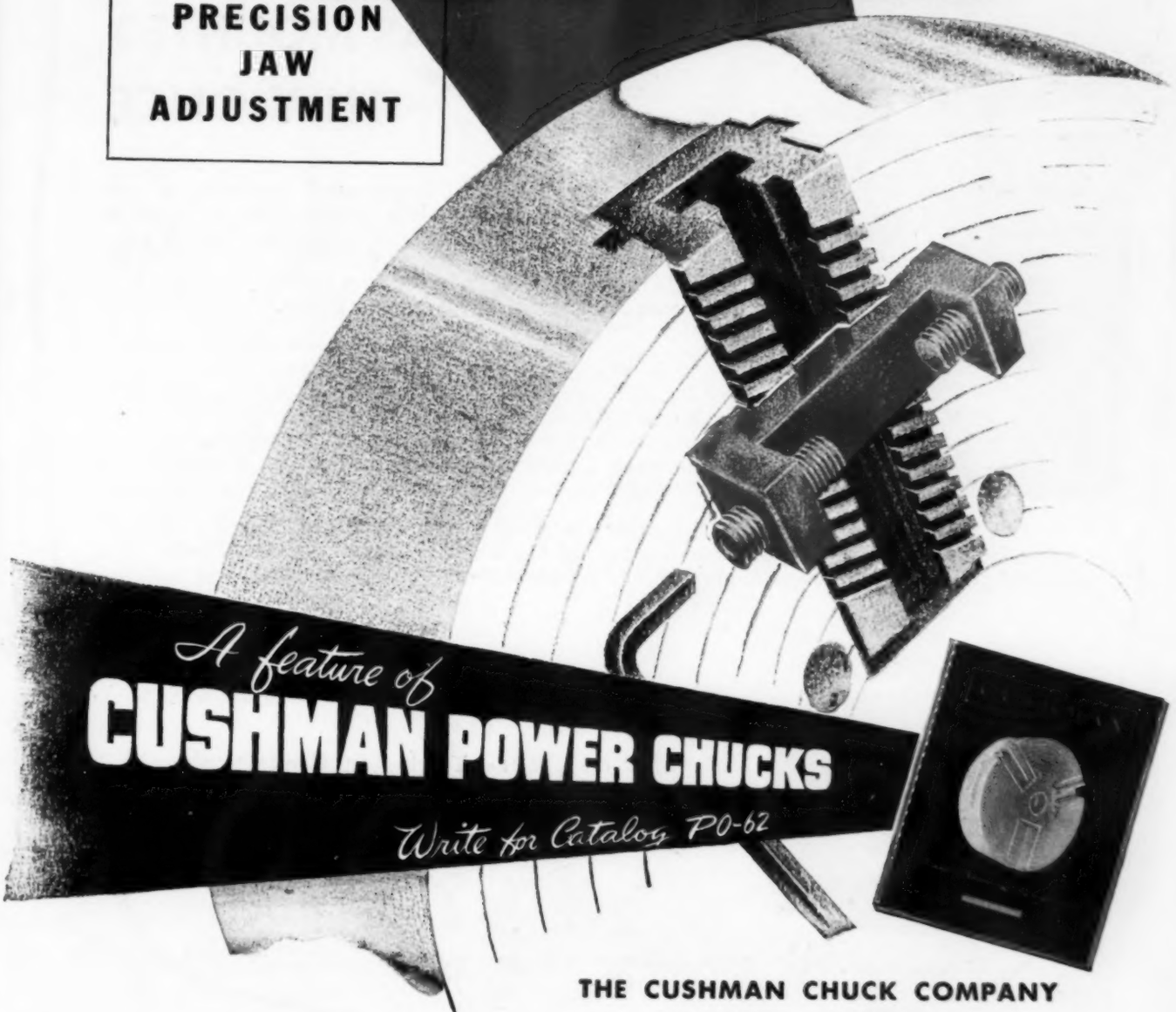

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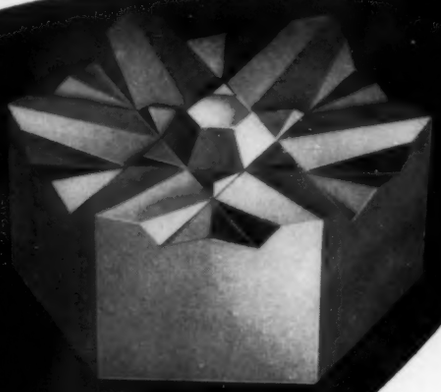

YET

THE PIECE WAS MOUNTED ONLY ONCE

Illustrative of the unusual flexibility of the Hendey 12" Shaper, the piece pictured above, was finished after being mounted *only once in the shaper's vise.* The operator took advantage of the universal table and made six different cuts to form an ordinary hexagon bar into an intricate shape with sixty facets.

But this is only one of several features inherent in the Hendey 12" Shaper. Production-wise you'll be able to remove metal at the rate of 182 feet per minute on a 6-inch stroke, with a vibrationless action that permits the highest degree of accuracy on fine tool and die work. Operation is simple and can be accomplished, through dual controls, from either side of the machine.

Offering performance hitherto unapproached in facility of operation, high rate of production and accuracy of work, the Hendey 12" High Speed Universal Crank Shaper is a machine you should investigate. Write today for catalog giving complete details.

The Hendey Machine Company

Hendey

Main Office and Plant — Torrington, Connecticut

Offices — N. Y., Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

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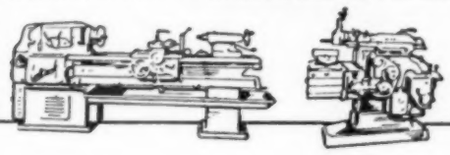
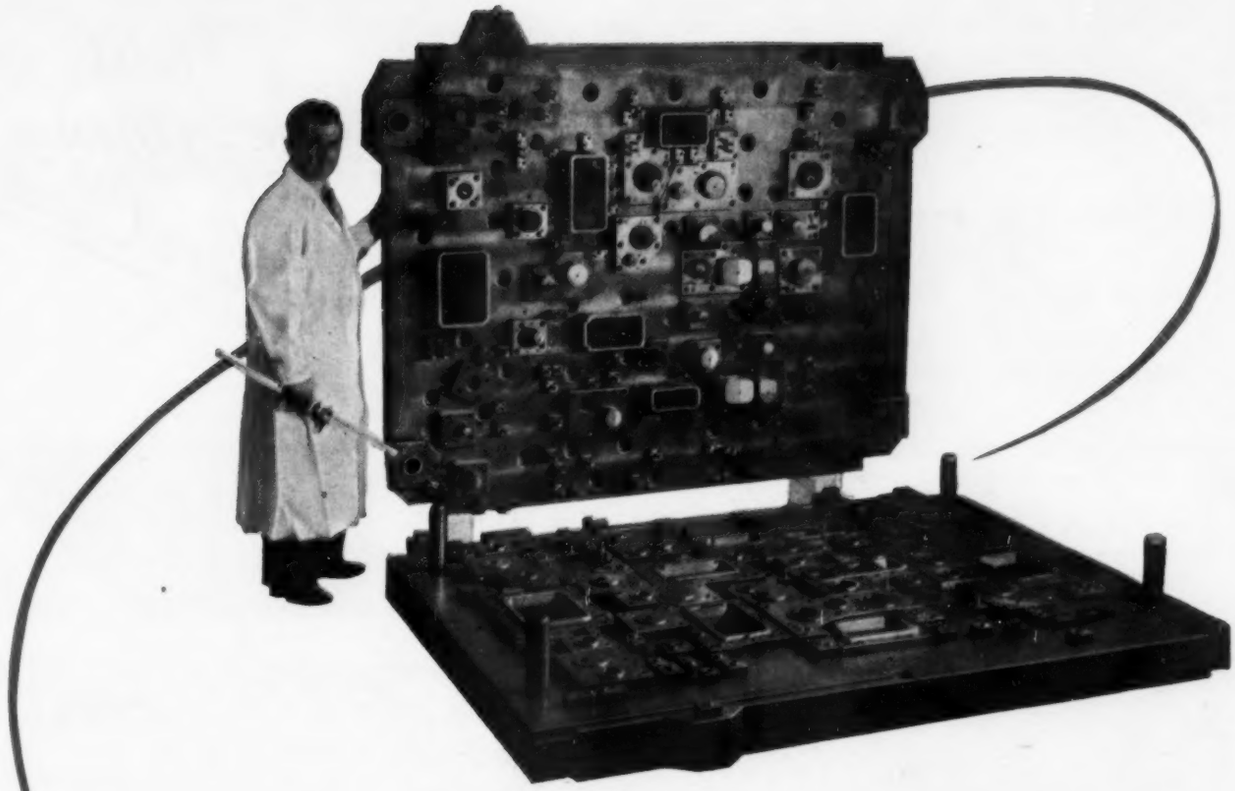


TOOL ROOM LATHES
12" - 14" - 16" - 18" - 20"

SHAPERS
12" - 16" - 20"



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Hold everything with *Walker Chucks*

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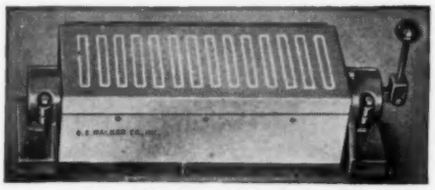

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O. S. WALKER CO. Inc.

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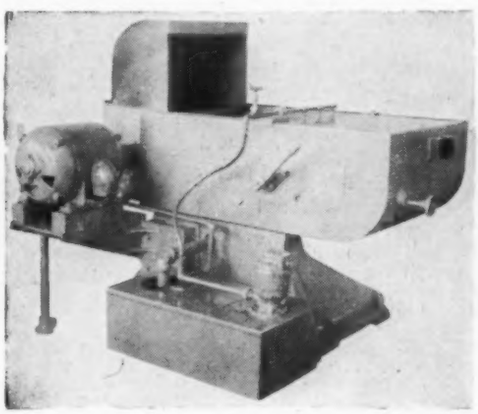

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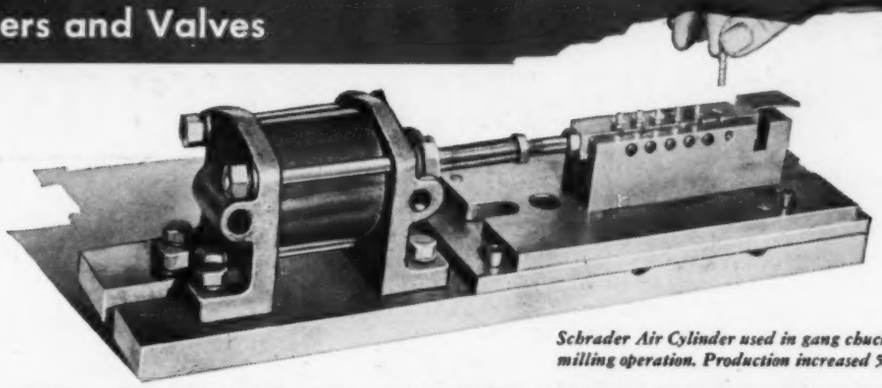

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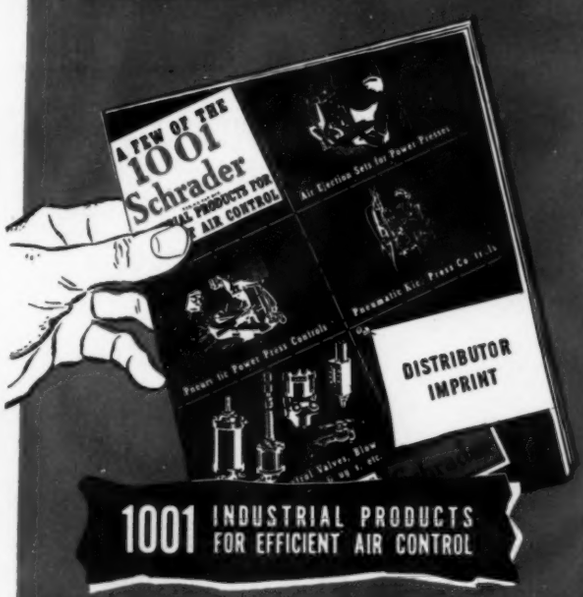

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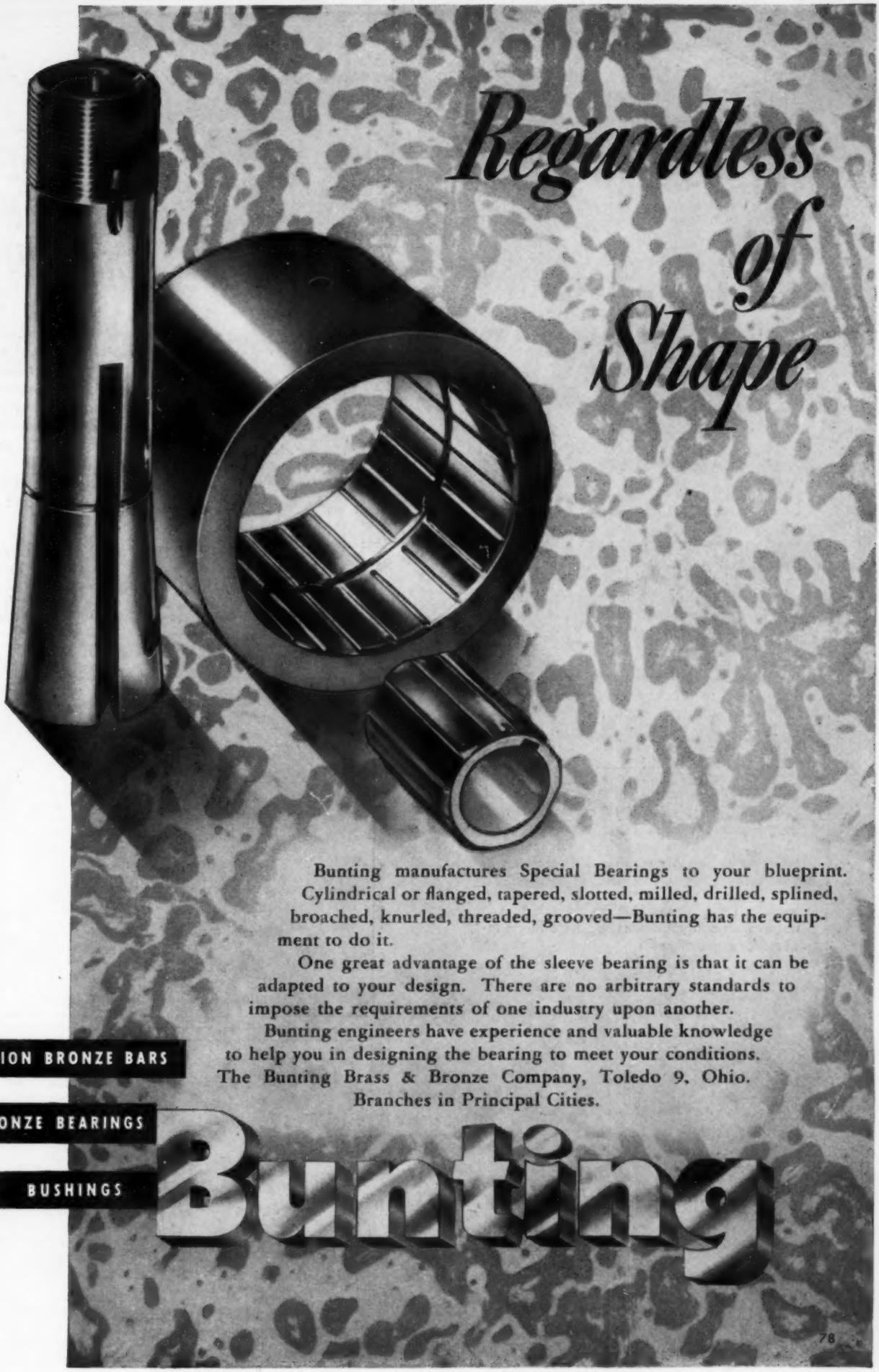
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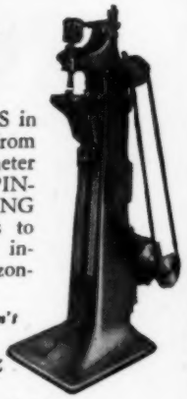

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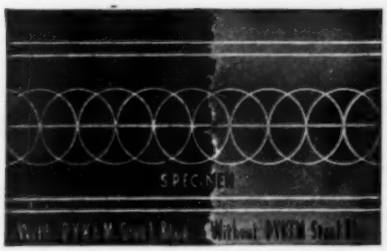
making dies & templates



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For complete information refer to pages 302-307 of Scully-Jones Tool Engineering Manual 500 and discount sheet dated March 15, 1947.

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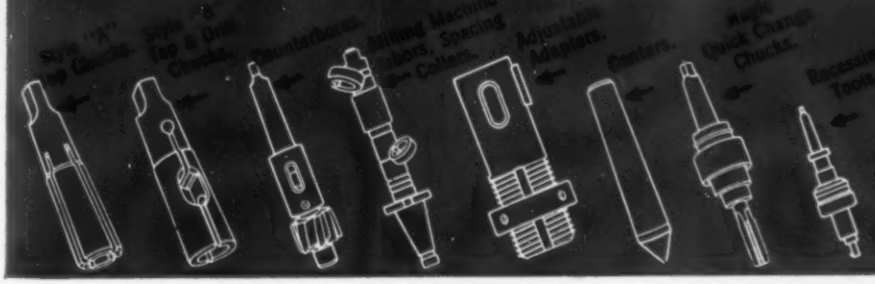
YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS



Scully-Jones AND COMPANY

1902 S. Rockwell Street
Chicago 8, Illinois

TORIT DUST COLLECTORS

Help keep the shavings out of shaving

The manufacturer of a famous shaving cream was having trouble removing the dust, bits of paper, and other material found in jars as they came from the supplier. Costly hand methods were used until the ingenious unit at the left was set up.

In this operation jars move under a hood, where an air jet blows the foreign matter loose and into the suction stream of a TORIT No. 52 Dust Collector. Sterilizing is done at the same time, and the jars move directly to filling machines.

This installation shows the adaptability of TORIT Dust Collectors to unusual tasks. Compact and self-contained, they fit all production layouts and can be moved as necessary. Models for standard grinding, polishing and cut-off machines are available for immediate delivery. For details and the latest TORIT catalog, write:

TORIT MANUFACTURING CO.

280 WALNUT ST. • ST. PAUL 2, MINN.

DON'T LET "SET-UPS" GET YOU DOWN

SEND YOUR SPECIAL JOBS TO WALTHAM SCREW!

When special jobs bog down your production line, it costs you money. If you "set-up" three times for a job that could be done in one operation on modern, multiple-spindle automatics with special jigs and fixtures . . . it's time you learned about Waltham Screw Company and their "Special Job Shop Service."

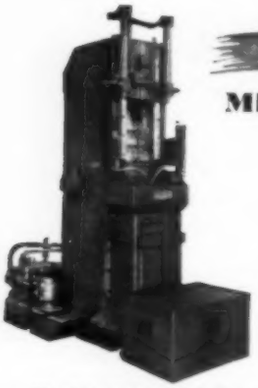
We'll knock out those "special jobs" for you in "jig" time and at a fraction of the cost. We're set up to do it . . . and we're selling that service, reasonably.

Send us blue prints of your "problem" TODAY.

We quote prices that please even the most pennywise.

WALTHAM SCREW COMPANY

731 Rumford Avenue, Dept. B
WALTHAM, MASS.



MEMO *to users of metal working equipment...*

The new features recently installed on all Ruthman Gusher Coolant Pumps increase efficiency, prolong life expectancy, and reduce maintenance cost.

RUTHMAN GUSHER COOLANT PUMPS

Illustrated is an Oilgear Type XP Vertical Broaching Machine equipped with a ½ HP Model TL-7320 Gusher Coolant Pump.

New type end-bell on totally enclosed motor has built-in conduit box with ample capacity to accommodate the multiple lead wires of dual voltage stators. Concealed through-bolts fastened from inside of upper end-bell give drip-proof construction and improved appearance. Oversized pre-lubricated ball bearings eliminate oilers or grease fittings.

Write now for Catalog 10-A

THE RUTHMAN MACHINERY CO.

1818 READING ROAD CINCINNATI 2, OHIO

Clean big parts with the Oakite Steam Gun!

HERE'S an easy way to clean metal parts that are too large to be soaked in tanks or conveyed through washing machines.

Just use the Oakite Solution-Lifting Steam Gun to apply an Oakite cleaning solution under about 40 pounds of steam pressure. Oil, grease and other dirts vanish quickly, leaving the parts ready for inspection, assembly, further machining, overhaul or repair. . . . The same gun may be used with Oakite paint-stripping solutions.

Free Demonstration—The Oakite Technical Service Representative in your vicinity will be glad to demonstrate the Oakite Steam Gun. Also ask him for the new Oakite Special Service Report on "Industrial Steam-Detergent Cleaning" or write to Oakite Products, Inc., 24 Thames St., New York 6, N. Y.

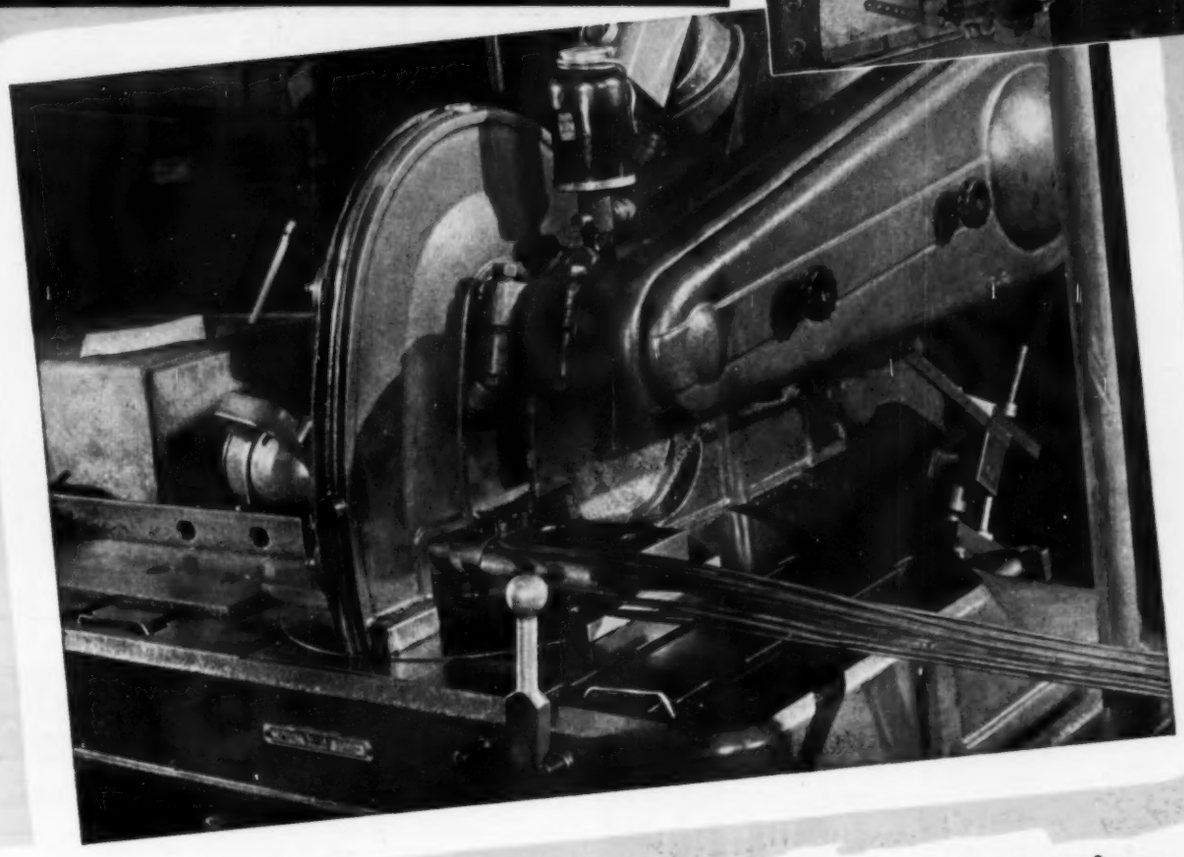
OAKITE

REG. U. S. PAT. OFF.

SPECIALIZED CLEANING MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

Inexpensive Air Motors* Double Output of Standard Cut-off Saw



From 4000 Pieces to 8000 Pieces per day is production record of this cut-off saw made automatic by Bellows "Controlled-Air-Power"

MILWAUKEE GAS SPECIALTIES COMPANY not only doubled production when they converted their hand operated cut-off saw to a semi-automatic machine, but they made a physically tiring job easy. Tool life was lengthened . . . quality of cut improved.

You, too, can convert your cut-off saw to an automatic unit quickly, and at low cost: A Bellows Air Motor to feed the saw, a Bellows Hydro-Check to provide utmost smoothness of feed, a second Bellows Air Motor to clamp the work.

Converting a cut-off saw to automatic operation is but one of many ways you can use Bellows "Controlled-Air-Power" to obtain faster production at lower cost. Any hand operated machine tool, such as drill presses, milling machines, grinders, etc., can be made automatic with Bellows equipment, quickly, and inexpensively.

We'll be happy to send you without cost

the newest Foto-Facts File Series which shows by photographs and case history what alert production men are accomplishing with "Controlled-Air-Power."

* The Air Cylinder with the *built-in* valve. 917

The Bellows Co.

Akron 9, Ohio

Mac-it ALLOY STEEL SCREWS

GET POSITIVE LOCKING ACTION
with
MAC-IT HOLLOW LOCK SCREWS!

Mac-it Hollow Lock Screws provide a locking arrangement that combines convenience with positive locking action. They lock as effectively after many thousand adjustments as they do the first time. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

DISTRIBUTED NATIONALLY BY
STRONG, CARLISLE & HAMMOND COMPANY
CLEVELAND 13, OHIO
MANUFACTURED BY
MAC-IT PARTS COMPANY LANCASTER, PA.

This was once the
"LAST WORD"
in hardness testers

YES, it was a real "ROCKWELL" Hardness Tester—a very early model—and a marvelous instrument in its time. It would contrast oddly with a modern "ROCKWELL" Hardness Tester. Yet there has been even more dramatic improvement in the whole science of hardness testing — due largely to the Wilson Standardizing Laboratory. Here ways are constantly being developed to make BRALE Diamond Penetrators even *more* permanently accurate — to make our test blocks even *more* uniformly dependable. In hardness testing equipment, we are not content to meet the requirements of industry. We try to anticipate them.

Also makers of the TUKON Microhardness Tester.

WILSON
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
230-B PARK AVENUE, NEW YORK 17, N. Y.

ACCO

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

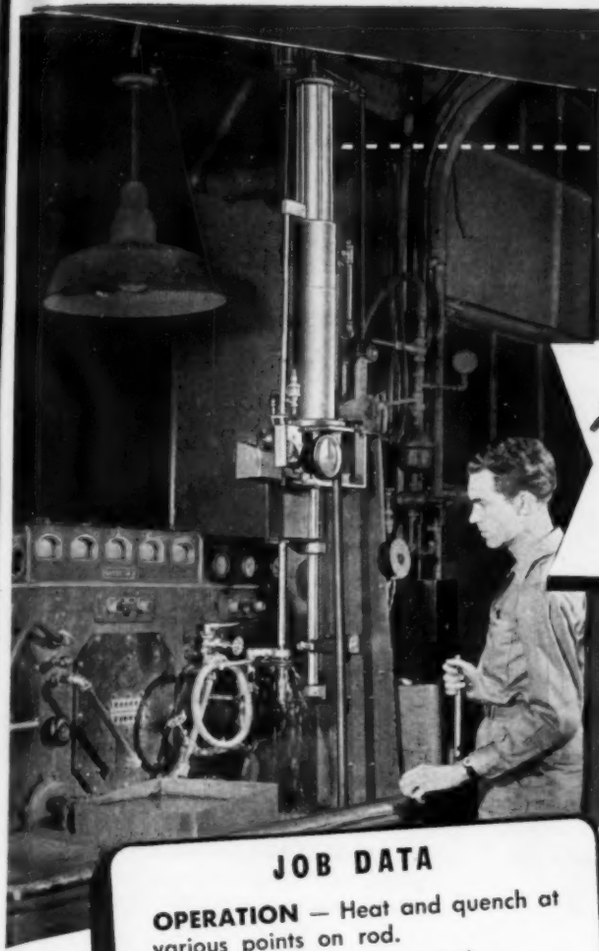
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

Any MICROMETER 1" to 18" size trued and lapped square

Pearson Precision "Micrometer Lapping Fixture" gives your plant constant *exact check* on all micrometers. Any good toolroom man can operate it expertly. No disassembling of micrometer other than removing spindle. Laps micrometer in exact right angle with center line of spindle; and in perfect alignment with end of micrometer spindle. Also makes an excellent comparator. Saving an hour's rejects may more than pay for this fixture.

Write for Literature
MANUFACTURED BY **RED WING MOTOR CO., RED WING, MINN.**

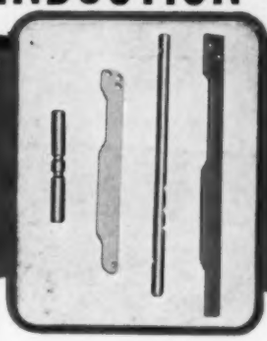


"LOGAN"

Air-Draulic Cylinder

AIR POWERED — OIL REGULATED

Accurately FEEDS SHIFT ROD for INDUCTION HEAT TREATING



- AIR Actuation with HYDRAULIC-TYPE Control Permits Varying Feed
- Automatic Interlocking Control of Cylinder and Induction Heating Coil

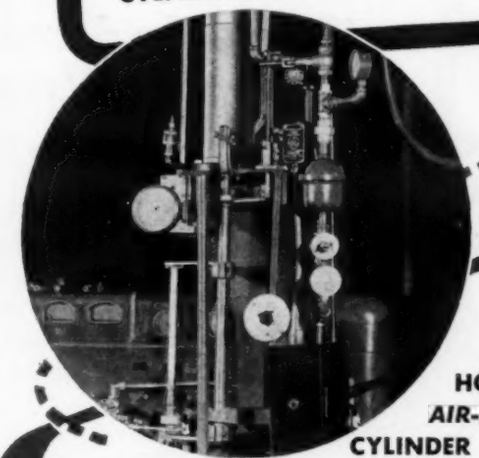
JOB DATA

OPERATION — Heat and quench at various points on rod.
STROKE TIME — 11 seconds.
CYL. SIZE — 3" bore, 15" stroke.
AIR PRESSURE — 90# reduced to 70#.
CYL. MOUNTING — Rod-end flange.

Uniformly accurate feed at a varying rate is required to heat treat sections of automotive shift rods at the plant of a large independent transmission producer. While compressed air is available, ordinary air cylinders do not provide the necessary control and uniformity of movement. The answer was found in the Logan *Air-Draulic* Cylinder.

An electric solenoid operated valve controls the air which powers the cylinder, and the cycle is initiated by pressing a button on the machine panel. As the *air piston* moves, oil flows between the chambers of the *hydraulic piston* on the common piston rod. Piston speed is regulated by a cam-operated valve in this self-contained hydraulic circuit.

A cam attached to the piston rod is designed to provide rapid approach and accurate feed at the required speed, with rapid completion of the stroke and return. Induction heating and quenching are co-ordinated with the cylinder movement. Shift rods of several sizes are handled on this machine by substituting different cams.



HOW THE *AIR-DRAULIC* CYLINDER IS MADE

- Separate air and hydraulic pistons assembled as an integral unit on a common piston rod.
- Self-contained hydraulic circuit does not require a hydraulic power unit.
- Air *operating* cylinder is brass-lined steel tubing; piston has cup packings, self-adjusted by air.
- Hydraulic *regulating* cylinder is centrifugal-cast iron; piston has 3 automotive-type rings.
- Standard sizes from 3" to 8" bore; any stroke to 5 ft. For operation at air pressures to 150 p.s.i.

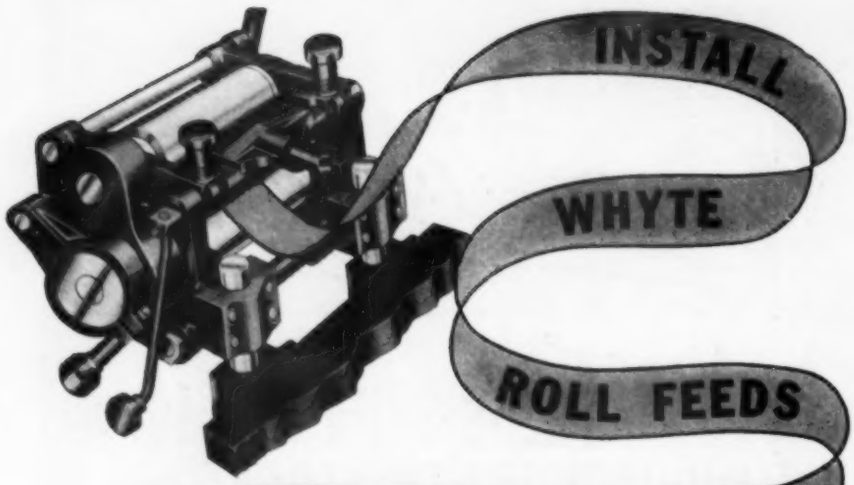
Write for FREE Literature and Engineering Help

Logan SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC.
918 CENTER AVE. LOGANSPORT INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS



INSTALL WHYTE ROLL FEEDS ON YOUR PUNCH PRESSES FOR UNINTERRUPTED PERFORMANCE

MADE IN ALL SIZES IN ALL CAPACITIES

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IMMEDIATE DELIVERIES ON MOST MODELS

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170 Broadway

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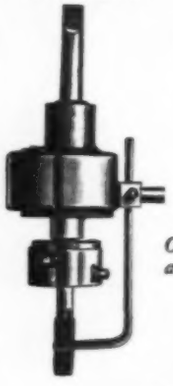
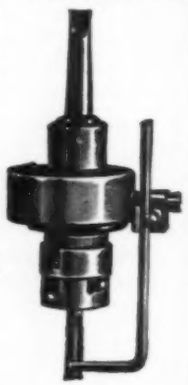


Size	Taps Exact Size Up to
No. 00 H.S.	1/8"
" 00	1/8"
" 0	1/8"
" 1	1/8"
" 2	3/8"
" 3	5/8"
" 4	3/4"
" 5	3/4"



Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyway with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
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For Faster, More Accurate Work Use this **WADE PRECISION LATHE**

Wade

Bench Lathes and Profilers
For Precision, Versatility
And Stamina

You can get faster, more accurate work with the Wade Model 8-A Toolmakers' Precision Lathe because it is carefully designed and built with features that give it extreme accuracy for exacting work. It helps speed up production by enabling men to work faster, with greater accuracy and with less spoilage. Operators can get a larger daily output because all control and operating features are carefully worked out for efficient handling of work.

Lathe bed is 44" with 24" between centers; swing over bed is 8½" and maximum collet capacity is 1". Weight, 1075 lbs.

You can depend on Wade Precision Lathes to save time . . . to save money . . . and to produce accurate work. For more profitable production of precision work, investigate this machine today. Write for catalog now.

THE WADE TOOL COMPANY

53 RIVER STREET • WALTHAM 54, MASS.

The finest of all hack saw blades . . .

MILFORD FLEXIBLE REZISTOR

is now made better than ever with M-2 high speed steel

This modern post-war steel means even *more* cutting . . . even *faster* cutting . . . for this outstanding blade which has been replacing all-hard blades with mechanics everywhere.

The same *safe* cutting, because it's shatter proof! The same *economical* cutting because there's no accidental breakage! Only the teeth are hardened . . . the back is tough and flexible. And the same *easy* cutting because of MILFORD'S exclusive Easy Starting Teeth.

This improved performance is typical of MILFORD'S continuous research, test and experiment. As better metal-cutting saw blades are made, MILFORD is making them!

Order from your mill supply distributor. He is always ready to serve your needs for all factory and mill supplies, as well as MILFORD hack saw and band saw blades.

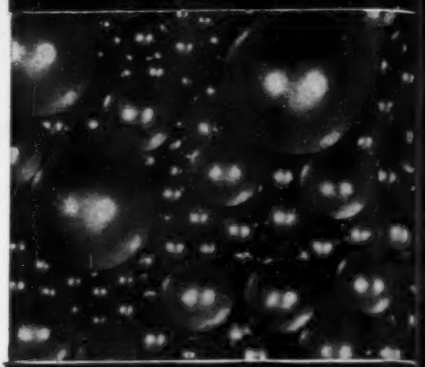
MILFORD PROFILE AND BAND SAW BLADES · REZISTOR AND DUPLEX HACK SAW BLADES

THE HENRY G. THOMPSON & SON CO.

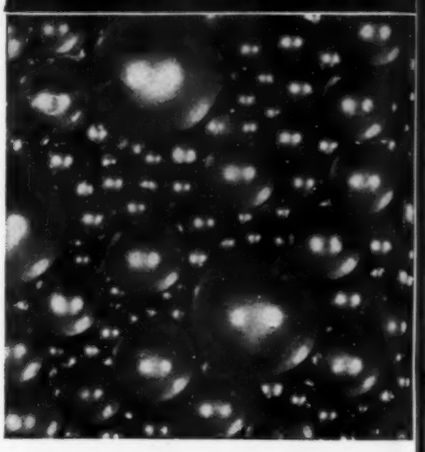
Saw Specialists Exclusively for Over 70 Years

NEW HAVEN 5, CONNECTICUT, U. S. A.

"Superior" STEEL BALLS



for "ALL-ROUND" SERVICE



YOU CAN DEPEND ON "Superior" FOR

BETTER UNIFORMITY . . .
GREATER HARDNESS . . .
CLOSER ACCURACY . . .
HIGHER ECONOMY . . .
SUPERIOR PERFORMANCE

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Superior STEEL BALL CO.

LAKE AT HIGH STS., NEW BRITAIN, CONN.

Manufacturers of

BALLS FOR BEARINGS · BURNISHING MATERIALS

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QUICK-CONNECTIVE COUPLINGS FOR

- AIR
- ACETYLENE
- OIL
- GASES
- GREASES
- STEAM
- OXYGEN
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CONNECTION TAKES ONLY A SECOND

Threading fluid line couplings on and off to connect or disconnect is an unnecessary waste of time. Any line can be quickly and easily connected by using a Hansen Coupling. And, in addition, couplings have shut-off features that prevent loss of the liquid or gas in the line.

When you want to connect a Hansen Coupling, it is merely necessary to push the plug into place, where it locks securely. The valve opens, and flow starts instantly. The same operation disconnects—move the sleeve, and the plug pops out. Flow is shut off automatically.

From a wide range of available sizes and types you can select one suitable for any application. Air, oil, and gas, oxygen and acetylene, gasoline, hydraulic oil, and steam—each type of service has a Hansen Coupling engineered to meet its specific requirements.

If you have any fluid lines in your plant, you can increase efficiency, save precious minutes, by the use of Hansen Couplings.

Write for industrial catalog No. 47 today

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BUZZER Gas BURNERS

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Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

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121 South Grand Avenue, Baldwin, L. I., N. Y.

This Business of Making Holes

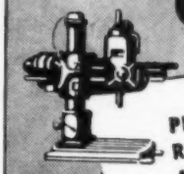
Probably the making of holes in one way or another accounts for more machining operations in the metal-working industries than any other type of stock removal. Mass production cannot be maintained unless fast, accurate equipment for the precision machining of holes is on the job constantly. That is why, since 1901, metal-working shops have been using MOLINE HOLE HOG cost-reducing equipment in production work.

For such operations as Boring, Milling, Straight Line Drilling, Universal Adjustable Spindle Drilling, Honing, Tapping, Reaming and Counterboring, or for ANY special problem, a Moline "Hole Hog" can do it for you faster at less cost.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20th Street Moline, Illinois

GILBERT



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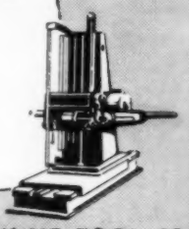

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THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

For Faster Smoother Cleaner Grinding ECONOMY

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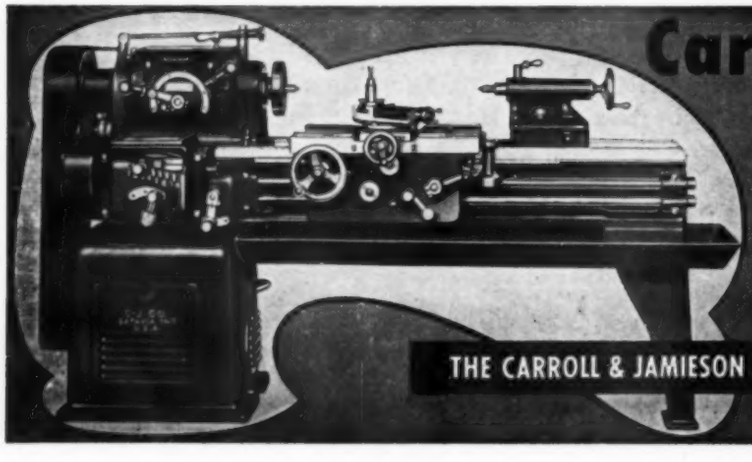
Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.



Carroll & Jamieson 16" LATHE

12 Speed Geared Head Motor Drive
Timken Mounted Spindle
Modern Design—
Liberal Dimensions
WRITE FOR BULLETIN

THE CARROLL & JAMIESON MACHINE TOOL CO., BATAVIA, OHIO, U. S. A.

ONLY PHILLIPS RECESSED HEAD SCREWS

OFFER PRODUCTION POTENTIAL ADEQUATE TO MEET *ALL* INDUSTRY'S NEEDS

25 SOURCES OF SUPPLY FOR PHILLIPS SCREWS

are represented by the screw manufacturers listed below. These 25 plants have a production potential of many million screws per 8-hour day. In Canada, Great Britain, Europe, and South America... Phillips Recessed Head Screws are also available from the leading screw manufacturers.

11 MAKERS OF PHILLIPS HAND DRIVERS AND BITS

—plus 46 tool plants which assemble Phillips pointed driver bars into complete drivers, make Phillips Drivers available everywhere ...in hardware and chain stores, and industrial supply houses.

LOOK AHEAD when you choose a cross recessed head screw. Whatever the supply situation, at any time, this tremendous capacity makes Phillips Screws constantly available.

Wherever your product is sold and used, there are, and always will be Phillips Drivers available for disassembly and reassembly.

Remember, unlimited production potential is one of the basic essentials you can't afford to overlook in choosing a cross recessed head screw. With Phillips Screws, you can depend on it. Specify *Phillips.*

GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . .

GET PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

25 SOURCES

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Continental Screw Co.
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Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoli Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
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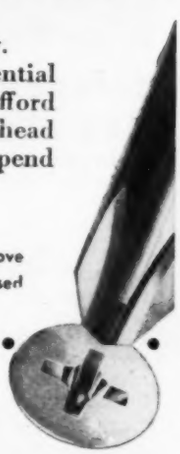
GET THIS NEW BOOKLET of facts that prove the top value, top economy of Phillips Recessed Head Screws. It's free . . . use the coupon.



Phillips Screw Mfrs.,
c/o Horton-Noyes Co.
1800 Industrial Trust Bldg.
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Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

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Company _____

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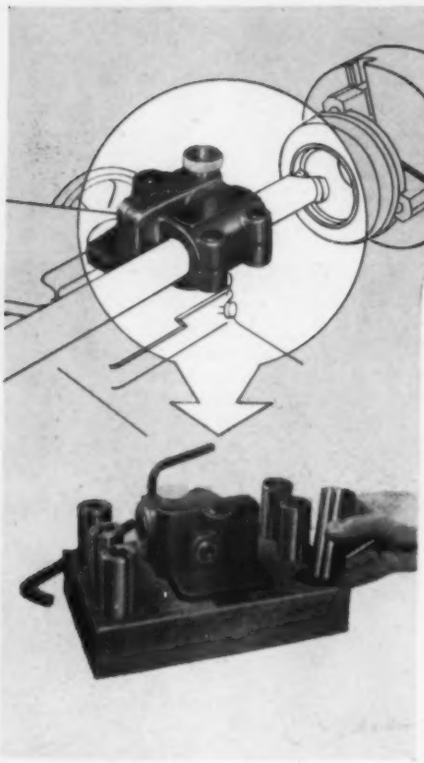

A HEAVY DUTY BORING and THREADING *Tool Holder* *with* VERTICAL ADJUSTMENT

It is designed to fit all sizes of Bokum Boring Tools up to No. 12 either direct or with split sleeve adapters. Greatly facilitates the accurate setting of tools to proper height.

Complete set consists of holder and 6 adapters—compactly arranged in a handy box. Send for folder K-488.

Now BORING TOOLS in SETS

This set, J-812, is composed of boring and facing cutters from No. 4 to No. 8 with 1 set of standard and 1 set of extra long shanks to fit ¾" boring chuck.

This set, J-1016, is composed of boring and facing cutters from No. 4 to No. 10 with 1 set each of standard and extra long shanks to fit 1" boring chuck.

Send for folder K-1139-6.

TRADE MARK REG. U. S. PAT. OFF.

BOKUM TOOL CO. 14775 WILDEMERE AVE. DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

Tolerances Worth Maintaining Are Worth Jo-Block Protection

When you set up dimensional inspection tolerances, it's to insure a specified class of fit in assembly, or to make sure of parts-interchangeability, or for some other good reason. The harder it is for a man to be *sure* he's staying within limits, *the more it costs.*

So, why not put a set of Ford Jo-Blocks on guard? Make it part of somebody's routine to check every working gage—whether snap-gage, micrometer caliper, dial indicator, plug-gage, ring-gage, or any other dimensional test device—with genuine Ford Jo-Blocks at definite, frequent intervals. Then, you'll *know* that everybody concerned is "speaking the same language" of measurement. Chances are that inspection will speed up and rejections at final inspection will be fewer.

Jo-Blocks are not expensive. They're made to three warranted accuracy standards—plus or minus .000002", .000004" and .000008". Sold throughout the Americas as single blocks or in varied sets (metric measurement, too). Extremely useful accessories available to expand and facilitate the use of Jo-Blocks. Write for illustrated literature. *Address:*

Johansson GAGE BLOCKS

FORD MOTOR COMPANY
JOHANSSON DIVISION
3601 Schaefer Road
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Save three ways with Grand Rapids No. BD-1 Combination Tap and Drill Grinder: 1. Lower first cost; 2. Less maintenance expense; 3. Valuable floor space.

Grand Rapids BD-1 combination Tap and Drill Grinder

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GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
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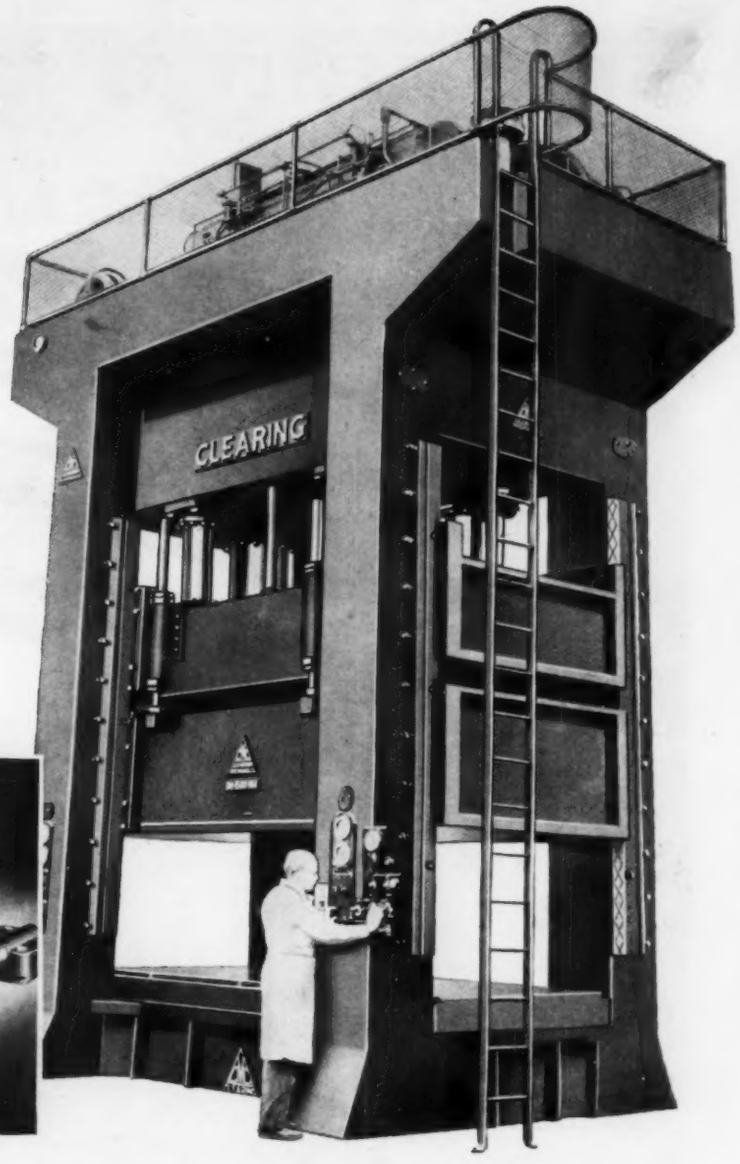
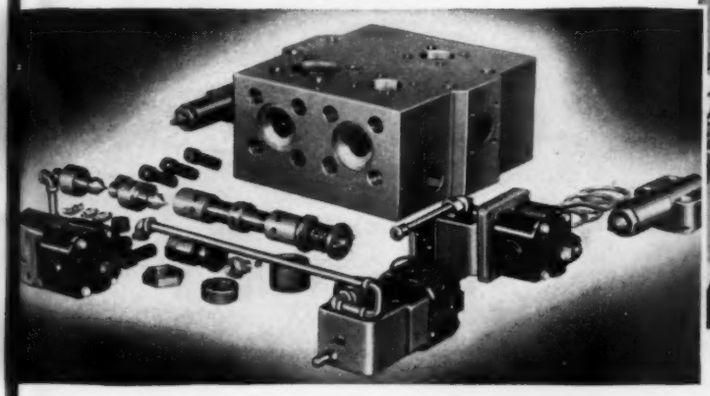
CLEARING

MECHANICAL & HYDRAULIC



INSET: Main operating valves of Clearing hydraulic systems are combined in a single forged steel block with ports and passages drilled from solid. Swift, automatic and safe performance of all hydraulic press functions is assured by this unique Clearing development.



HOW DO YOU MEASURE ECONOMY?

Substitution of press methods for casting, machining, or other slow means of manufacture will almost invariably result in a substantial saving in production costs. But whether such a step gives you maximum economy depends upon how efficiently you are able to operate your presses.

Don't be content with "a saving." Get *all* the saving you can, while you're at it. Consider die life, press output, operating and maintenance costs. Don't forget that delays and extra work in assembly should be charged to press costs if they are due to inaccurate or varying stampings.

Proper consideration of all pertinent factors will lead you most often to Clearing presses. That's a statement that's hard to explain but easy to prove. We'll be glad to prove it to your satisfaction—and to your profit as well. Put your problem up to our engineers.

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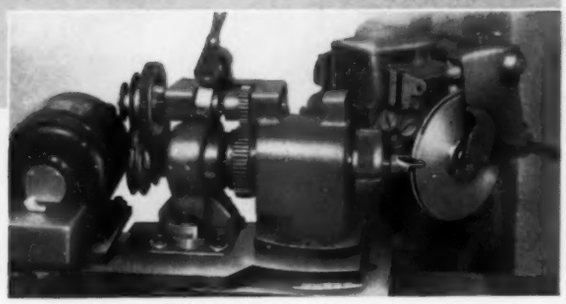
CLEARING THE WAY TO EFFICIENT MASS PRODUCTION

GRIND RELIEF ON TOOLS

like these...

FASTER
EASIER
ACCURATELY



THE CIRCULARITY-GRINDING **ATTACHMENT** is quickly and accurately set up to grind any of the various types of relief on tools such as those shown . . . radial, form, radial and form relief combined.

No special cams or fixtures are needed for any set-up and no matter what type of relief is being ground, the tool revolves on its own axial center. The amount of relief to be ground is easily adjusted by scales provided on the attachment. All tools ground from a set-up have identical relief produced on them and by recording the scale readings, the same set-up can be made accurately time and time again.

Send for our new illustrated bulletin which gives full particulars on the set up and operation of the Circularity-Grinding Attachment.

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DETROIT REAMER & TOOL CO.

Mfrs. of Special High Speed Cutting Tools

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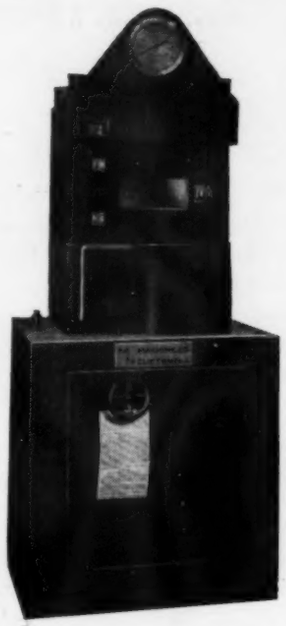

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- **Prompt Delivery**

Also adapted to Blanking, Forming, Embossing, Hobbing

Prompt response—with absolute control of moving parts for precision blanking, forming, drawing, embossing, shearing, and other uses.

The M & N Hobbing Press is delivered ready-to-operate—simply hook the electrical connection to your power line. Completely self-contained, this sturdily built press requires a minimum of floor space.

Special M & N Hobbing Presses can be built to your specifications. Write for our new, illustrated catalog on standard M & N hydraulic equipment.

M & N Machine Tool Works, Inc.

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—when you're thinking of "special" tools

"Special" in more than the usual sense of the word are these cemented carbide cutting tools by GORHAM. Whatever your needs in custom-built tools, the name GORHAM means highest quality. Our engineers are experts in the design, application and manufacture of carbide-tipped cutting tools. When you want a "special" tool for a special job, call GORHAM to solve your problem. Our long experience in the field will help you do the job faster, better, more economically. The facilities of our modern plant are at your disposal.

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50% more working surface

WITH MERZ UNIVERSAL CHECKING PLATES

MERZ Universal Checking Plates are of unique design, with all attachments connected on the outside. The result is 50% more working surface —an advantage found only in MERZ.

You can depend on MERZ Checking Plates and Fixtures to speed up complicated checking operations. Bench centers and "V" blocks are fitted by exclusive design, with angle groove in master plate and attachments. This maintains positive pressure against edge and surface at all times. Various attachments, including a 20″ sine bar fixture, offer a wide range of checking combinations not available with standard units.

MERZ Universal Checking Plates and Fixtures are cast from special, fine-grained gray-iron alloys —are extremely rigid and unconditionally guaranteed against warpage. Available in a wide range of sizes to meet every requirement.

MERZ builds a complete line of precision inspection equipment, including AGD standard plugs and gages and well-known *New-Matic* Measuring Machines, Taper Gages and Automatic Sorting Machines. Write for complete information, including illustrated technical data.

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FISKE'S #231 DIE CASTING COMPOUND produces clean, smooth pieces, free from surface imperfections and discoloration. Through minimum gas formation, stronger and more accurate castings result. More passes between applications hence greater production. Gives longer die life. Does not fume, flash or solder. Application by brush, swab or spray. Suitable for large as well as small aluminum and zinc alloy castings. Write for full information.

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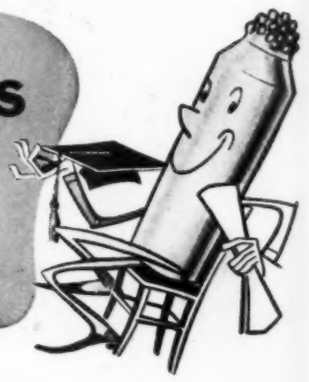
DRESSERS WITH A DEGREE!



Yes, Carboloy Diamond Dressers have a degree—a greater degree of usefulness than you've ever seen in any other dresser. Why? Because of their

"EDUCATED DIAMONDS"

They stand abuse . . . and *can't* come loose!

A matrix of Carboloy Cemented Carbide holds them fast for a longer, more useful life.

These small, *inexpensive* diamonds, firmly embedded in *the hardest metal made by man,* can save you up to 40% in dressing costs!

Don't let diamond loss and replacement eat into your profits any longer. Ask us for our free brochure, DR-480, "More Profitable Use of Diamonds for Dressing Grinding Wheels." There's no obligation. *Carboloy Co., Inc., 11149 E. 8 Mile Ave., Detroit 32, Michigan.*

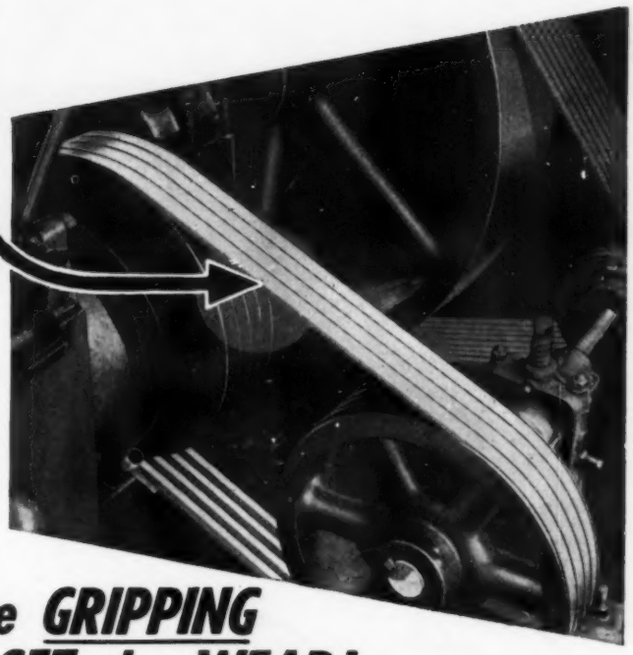
DIAMOND DRESSERS

by CARBOLOY®

THE SIDES of a V-BELT

Diagram of V-Belt in Sheave-Groove

Are ALL that TOUCH the Pulley



The SIDES Do ALL the GRIPPING Naturally — They GET the WEAR!

The moment you look at a V-Belt in its sheave, you see that the *sides* are the only part that ever *touch* the pulley. The *sides* do all the *gripping*—they get *all the wear* against the sheave groove wall. The sides *pick up* the load. They transmit that load to the belt as a whole. And then, once more, the sides—and the sides alone—take hold of the driven pulley and deliver the power to it.

That is why you have always noticed that the sidewall of the *ordinary* V-belt is the part that *wears out first.*

That's Why the CONCAVE SIDE
A GATES PATENT

Fig. 1

Straight Sided V-Belt

Fig. 1-A

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a Straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Fig. 2

Gates V-Belt with Patented Concave Sidewall

Fig. 2-A

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt is Bending Over Pulley.

No bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall — and that means much longer life for the belt!

Is IMPORTANT to You

Since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will naturally lengthen the life of the belt.

The simple diagrams on the left show exactly why the ordinary, straight-sided V-belt gets excessive wear along the *middle* of the sides. The diagrams show also why the Patented Concave Side greatly *lengthens the life* of the *sidewalls* of Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-belt can possibly give.

The Concave Side is Even MORE IMPORTANT Now that SUPER VULCO ROPES *Are Available!*

Now that Gates *SPECIALIZED* Research has resulted in Super Vulco Ropes capable of carrying much heavier loads—fully 40% higher horsepower ratings—the sidewall of the belt is called upon to do even more work in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important now than ever before!

The Gates Rubber Company

"The World's Largest Makers of V-Belts"

DENVER, U. S. A.

483

Gates

THE MARK OF SPECIALIZED RESEARCH

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

Cutting Costs...

ONE CUTTING OIL FOR EVERY JOB

Safco 556 is the universal cutting oil around the plant of a large Mid-West appliance manufacturer. It is the *only* cutting oil used in the many operations on a wide variety of ferrous and non-ferrous parts. The change to *Safco* 556 put an end to stocking many expensive cutting oils and compounds for individual operations. Now *Safco* 556 is piped to every machine from a central tank to simplify production and cut costs.

That tiny stainless steel button shown above, actual size, is one of the numerous parts made. The list below shows the metals being used and the operations performed on them. In all these operations, experience with *Safco* 556 shows that tools stay sharper longer... faster cutting and better finishes are possible ... production cycles are speeded up... and the transparency and non-irritating qualities of the oil make a hit with operators.

These are good reasons for switching to *Safco*. Find out what savings can be made in *your* plant ... get the recommendations of a Swan-Finch lubrication engineer. Ask to have him call.

Metals: brass, copper, bronze, aluminum, nickel, silver, stainless steel, Sanderson tool steel, SAE 1020, 1040 and 1050 steel.

Operations: drilling, boring, reaming, tapping, threading, turning, facing, chamfering, forming.

4453

SWAN-FINCH OIL CORPORATION
R.C.A. BUILDING WEST • NEW YORK 20, N. Y.

As Dependable as "Old Faithful".. **VALVAIR**

Diagram shows double-acting air cylinder operated by Valvair 4-way solenoid valve, spring return.

DEPENDABILITY — That's outstanding in Valvair performance. Solenoids are Stellite-welded to resist wear; do not mushroom. Standard Valvairs have operated over 2,000,000 times at 100 lbs. with never a leak. *Exclusive features.* Patented basic design eliminates metal seats; non-corrosive (cast bronze body, stainless steel parts); full pipe area used with minimum drop. 2-way, 3-way, 4-way types. Get full details and prices.

ASK FOR BULLETIN "A-A"

VALVAIR CORPORATION • 454 Morgan Avenue, Akron 11, Ohio

Valvair

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

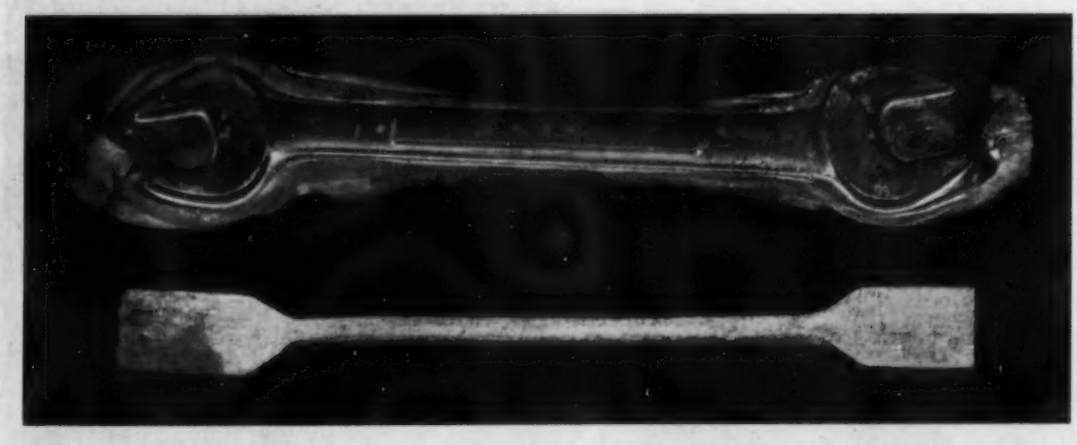
Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI 22, OHIO



BLANK PRE-FORMED . . . FREE!

National's new Maxiroll pre-forms the above wrench blank free of cost.

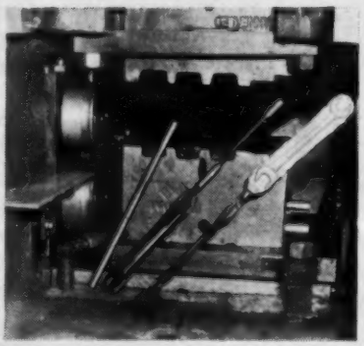
Located in a side window of the Maxipres and driven by the press, this newly-developed reducing mechanism, the Maxiroll, does this pre-forming on round or flat stock while the previous wrench is being finish-forged.

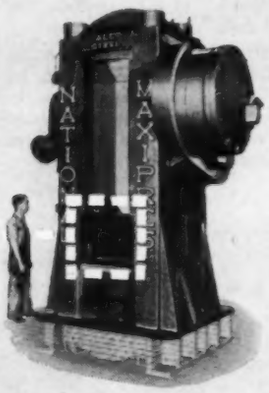
The rolls occupy none of the useful die space, and can be loaded with equal facility by the heater from the front or the rear of the Maxipres. Off-the-bar rolling and forging is another entirely practical application.

The principal advantages of Maxirolling on this and other jobs are

LESS MATERIAL
INCREASED DIE LIFE
HIGHER PRODUCTIONS

We will welcome the opportunity to help you investigate the application of Maxirolling to your products.





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TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINER

New York Detroit Chicago

ROTO-MATICS

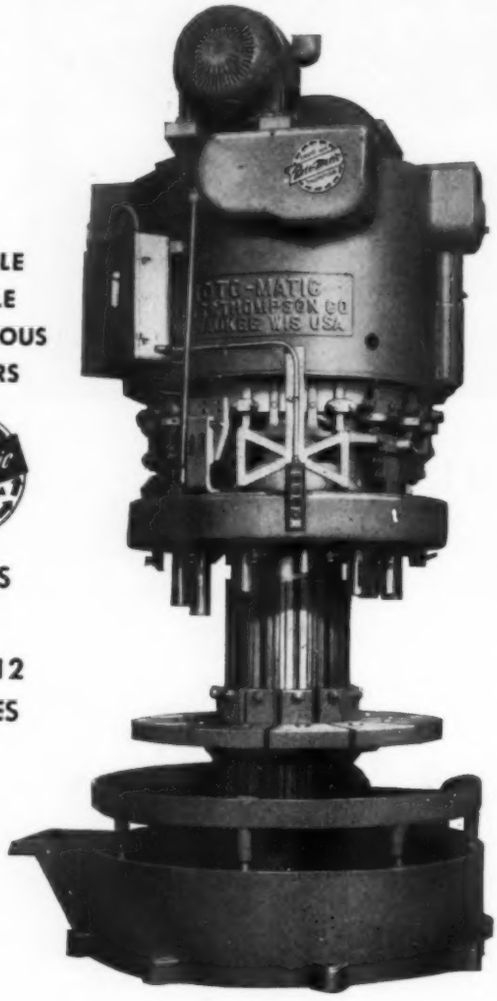
VERTICAL

MULTIPLE SPINDLE CONTINUOUS DRILLERS

DAVIS and THOMPSON Roto-Matic

3 SIZES

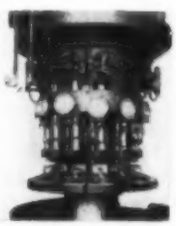
6-8 OR 12 SPINDLES



One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.

2 SPINDLE DRILL HEADS



BALANCING OPERATION

AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.
MANUFACTURERS OF *Machine Tools*
MILWAUKEE 14, WISCONSIN

"THERE JUST ISN'T ANY 'ONE-SHOT' CUTTING FLUID"

...says "CHIP" WRIGHT

"You know, I've been around shops a long time and I've seen more than one man who thought he had a cutting fluid that could be used for everything. But, it just doesn't work that way. When you overdo standardization or simplification, trouble develops. Speeds, feeds, materials, tolerance and finish requirements all help determine the correct cutting fluid for the job. Because of this, I have found it best to rely on the recommendations of experienced cutting oil people. It's false economy to over-standardize or over-economize when it comes to cutting fluids."

—Chip

A Word About SOLVOL water-mixed cutting compound

SOLVOL, D. A. Stuart Oil Company's modern water-mix compound, will solve some of your machinery problems, eliminate some of your headaches. SOLVOL is more than just a high grade emulsifiable cutting fluid. It is a unique product incorporating extra cutting qualities which enable it to perform metal cutting jobs beyond the scope of other soluble products. Write for SOLVOL Booklet.

Another Time-Tested Stuart Product

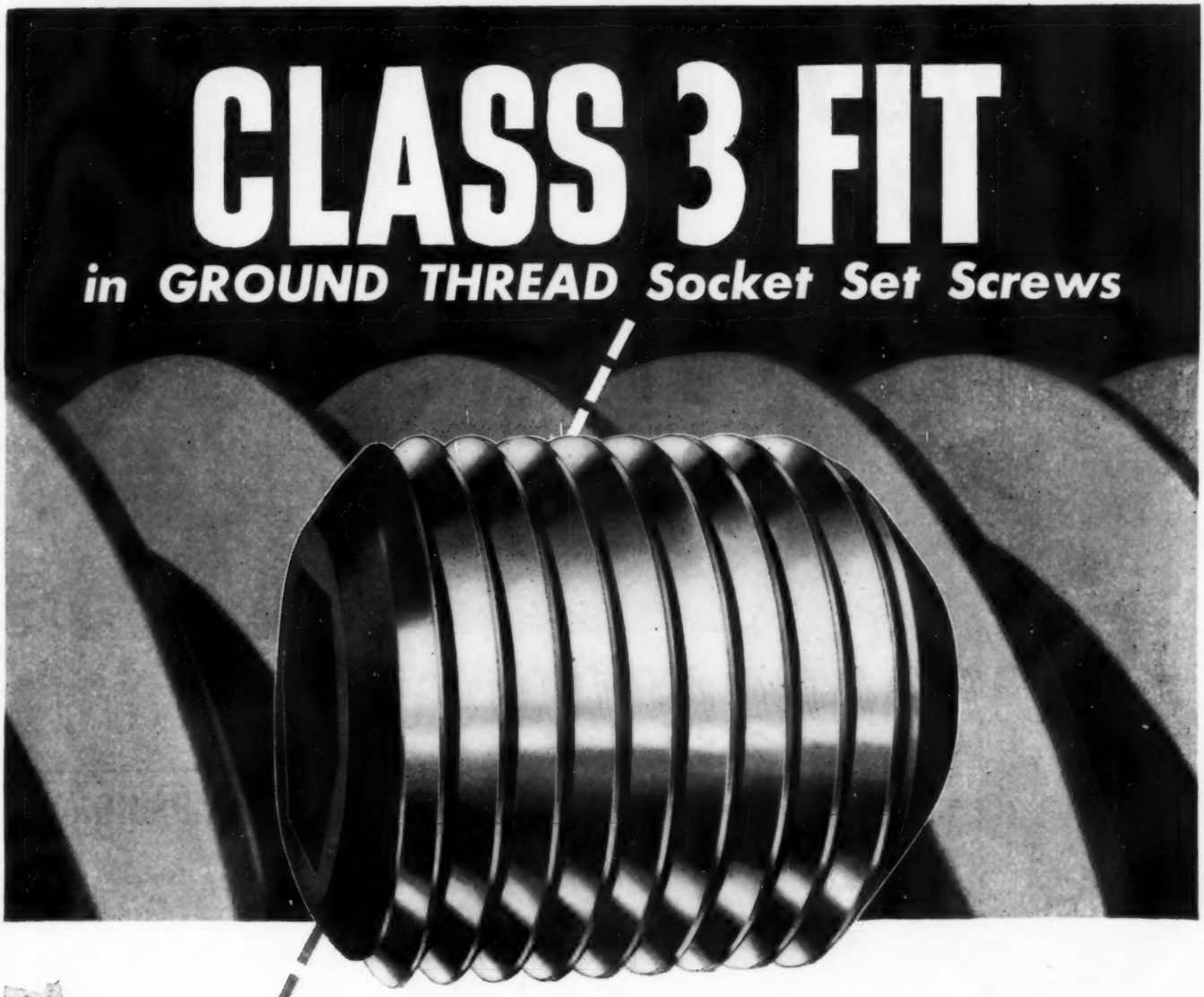
D. A. Stuart Oil Co.

2729 SOUTH TROY STREET, CHICAGO 23, ILL.

You're O.K. with P-K for Dependable

CLASS 3 FIT

in GROUND THREAD Socket Set Screws



THE COMPARATOR, used in inspecting every lot of P-K Ground Thread Socket Set Screws, clearly shows why you can be sure of uniform, dependable Class 3 Fit. Threads are ground on hardened blanks, by the first successful quantity production thread grinding process, with many advantages offered first in Socket Set Screws by Parker-Kalon.

Free from hardening distortion, mirror smooth, they have none of the nicks, burrs and other imperfections common to cut threads.

SEE AND FEEL THE DIFFERENCE! Ask for samples. See why P-K Ground Thread Socket Set Screws are years ahead by every test . . . why they'll put your product out in front — assembly-wise and sales-wise. Parker-Kalon Corp., 200 Varick St., New York 14.

Available for Prompt Delivery

PARKER-KALON COLD-FORGED **SOCKET SCREWS**

SOLD ONLY BY ACCREDITED DISTRIBUTORS

Goss & DeLeeuw

MACHINE COMPANY
KENSINGTON, CONN.

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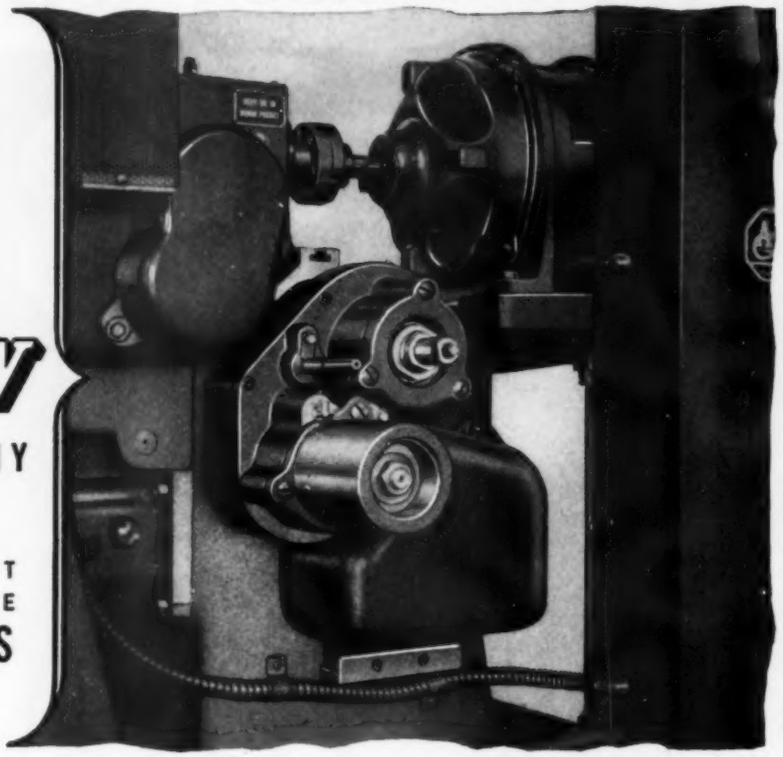
THE WORLD'S FINEST
MULTIPLE SPINDLE
CHUCKING MACHINES



THIS KIT BELONGS IN YOUR SHOP

With it you can cut keyways by hand *in one minute* in gears, cutters, couplings, collars, pulley hubs, etc.

QUICKLY PAYS FOR ITSELF

Cut a few keyways — the Kit covers a wide range of standard widths and depths — and you've saved the cost of the Kit and of a du Mont Arbor Press for this and many other shop uses.

Ask your *Industrial Distributor* to show you **the du MONT *Minute Man*® KEYWAY BROACH KIT** or *mail this coupon*

The du MONT CORPORATION, GREENFIELD, MASS.

Please mail me the *Minute Man* Manual A containing complete description and prices of Keyway Broach Kits and valuable reference information.

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DIE CUSHIONS

. . . for every punch press operation

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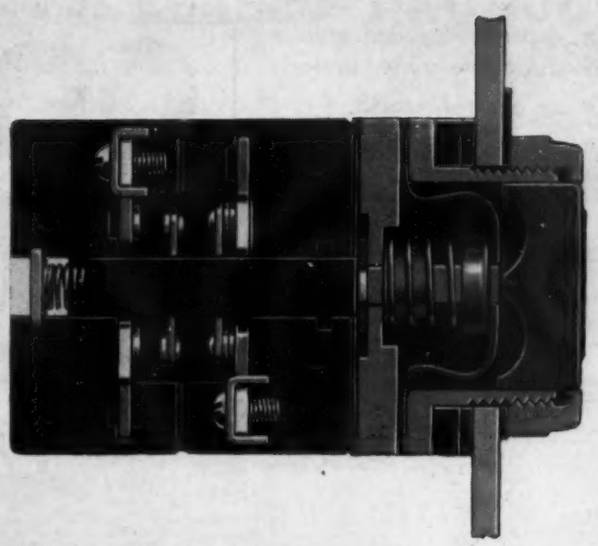


At left: Sectional view of Allen-Bradley Oiltight Push Button. Flexible diaphragm and panel gasket exclude cutting fluids.

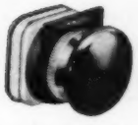
Below: External view of the same push button.

OILTIGHT CONTROL UNITS for Machine Tool Control

START BUTTON

STOP BUTTON

JOGGING BUTTON

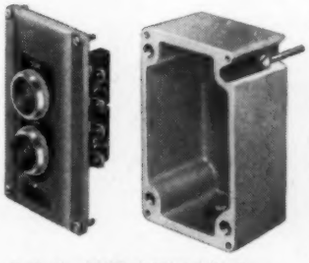


MUSHROOM BUTTON

SELECTOR SWITCH

For machine tools and similar equipment, flooded with cutting fluids, Allen-Bradley Bulletin 800 Oiltight Control Units are a basic requirement.

These attractive-looking control units are compactly designed. They consist of one or two contact blocks combined with a variety of operators (illustrated above) to meet any need. Each contact block has one normally open and one normally closed contacts.



Bulletin 800T Oiltight Surface Mounting Push-Button Control Station. Cover removed to show mounting holes.

Allen-Bradley Oiltight Control Units are mounted in a single hole which is notched to prevent turning. These oiltight units can be closely grouped on a control panel or machine base. The push buttons are available with black or colored buttons — green, blue, brown, yellow, orange, and gray. Pilot lights can be supplied with blue, red, green, amber, clear, and white bezels. Jogging button or selector switch also available. Write for Bulletin 800T. Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY

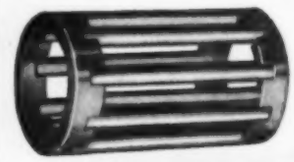
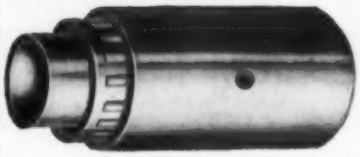
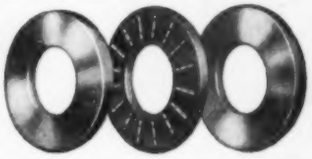
QUALITY MOTOR CONTROLS

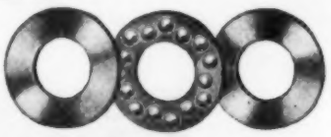
B & RB Precision Bearings

Are selected for dependability and greater capacity. Standard sizes are carried in stock.

Write for our general catalog.

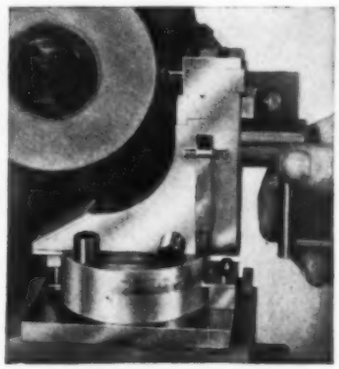
THE BALL AND ROLLER BEARING CO.
DANBURY, CONNECTICUT



★ ★ ★ *Fluidmotion*

Simplest and most accurate method of FORM-DRESSING



● "Fluidmotion" Wheel Dressers generate wheel profiles in such a way that angles and radii flow into each other, without sharp changes of direction. Two angles and a radius can be dressed in one continuous motion—after only one setting of the dresser. "Fluidmotion" Dressers are made of the finest chromium - molybdenum-vanadium alloy steels and have no wearing surfaces, as the gibs and V ways are positioning surfaces only and the dresser swivels on completely dust-protected ball bearings. Several models available. Model F, illustrated, is the smallest. 5" height to diamond center, dresses wheels up to 7" in diameter, profile radius up to 2". Write for booklet.

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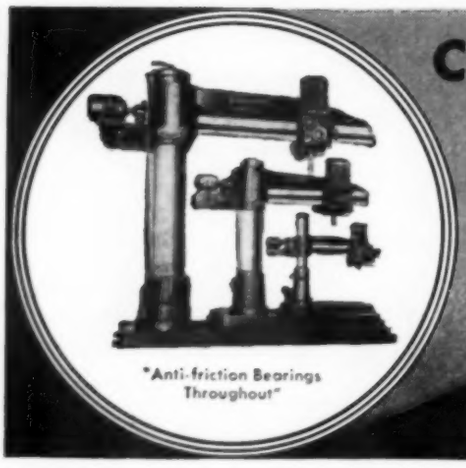

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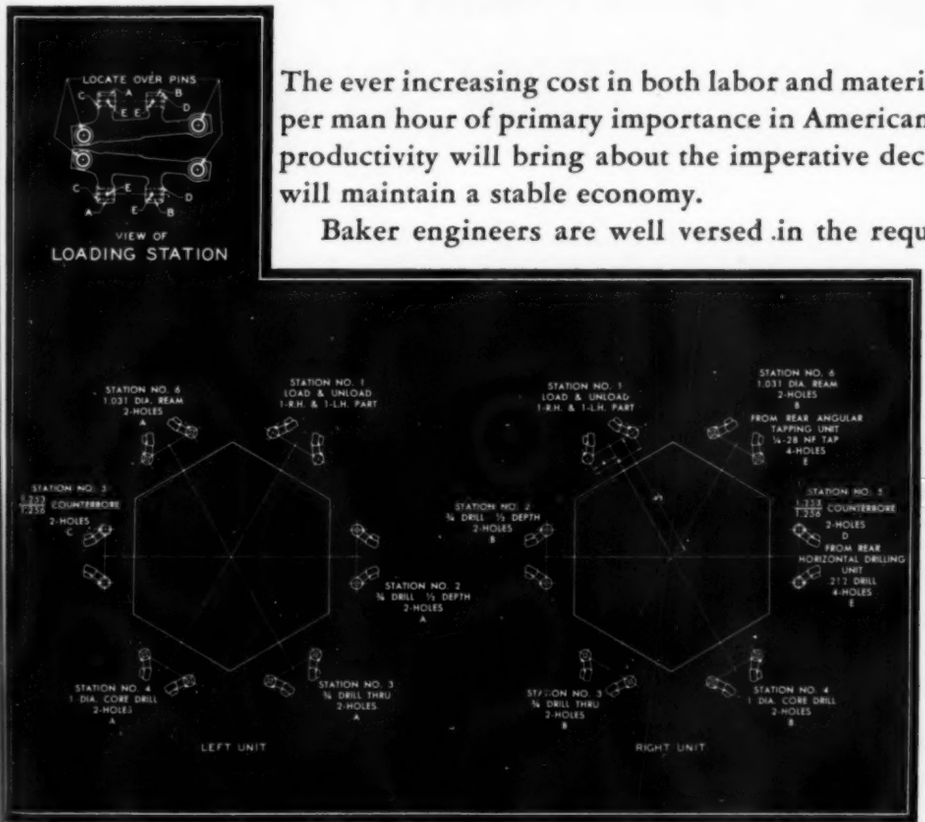
BAKER PRODUCTION MACHINES

Baker multi-operation machine does drilling, boring, reaming, counterboring and tapping operations on automobile front wheel spindle supports.



The ever increasing cost in both labor and materials makes greater productivity per man hour of primary importance in American industry today. Only greater productivity will bring about the imperative decrease in production cost that will maintain a stable economy.

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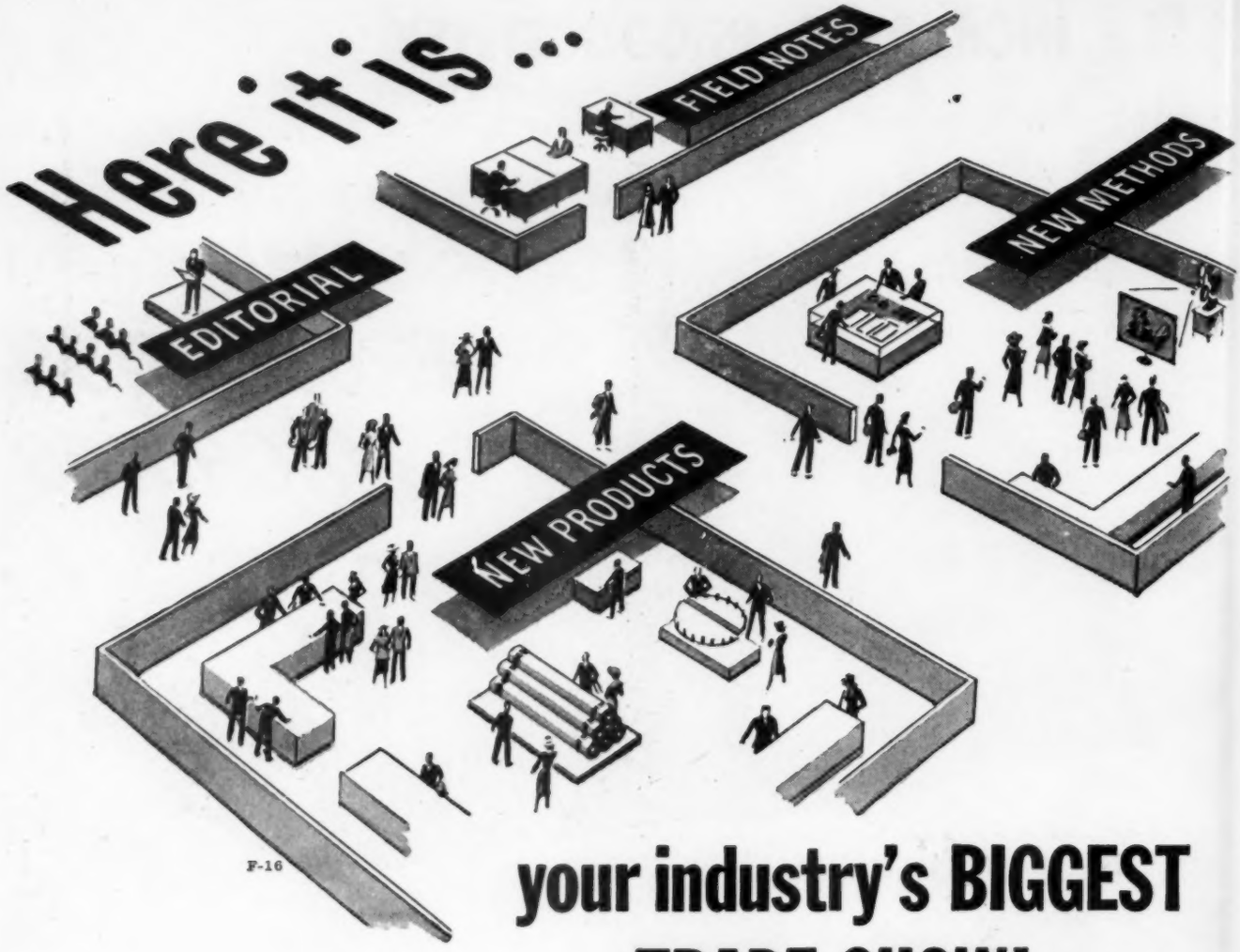

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American Machinist

HEADQUARTERS FOR INDUSTRIAL INFORMATION

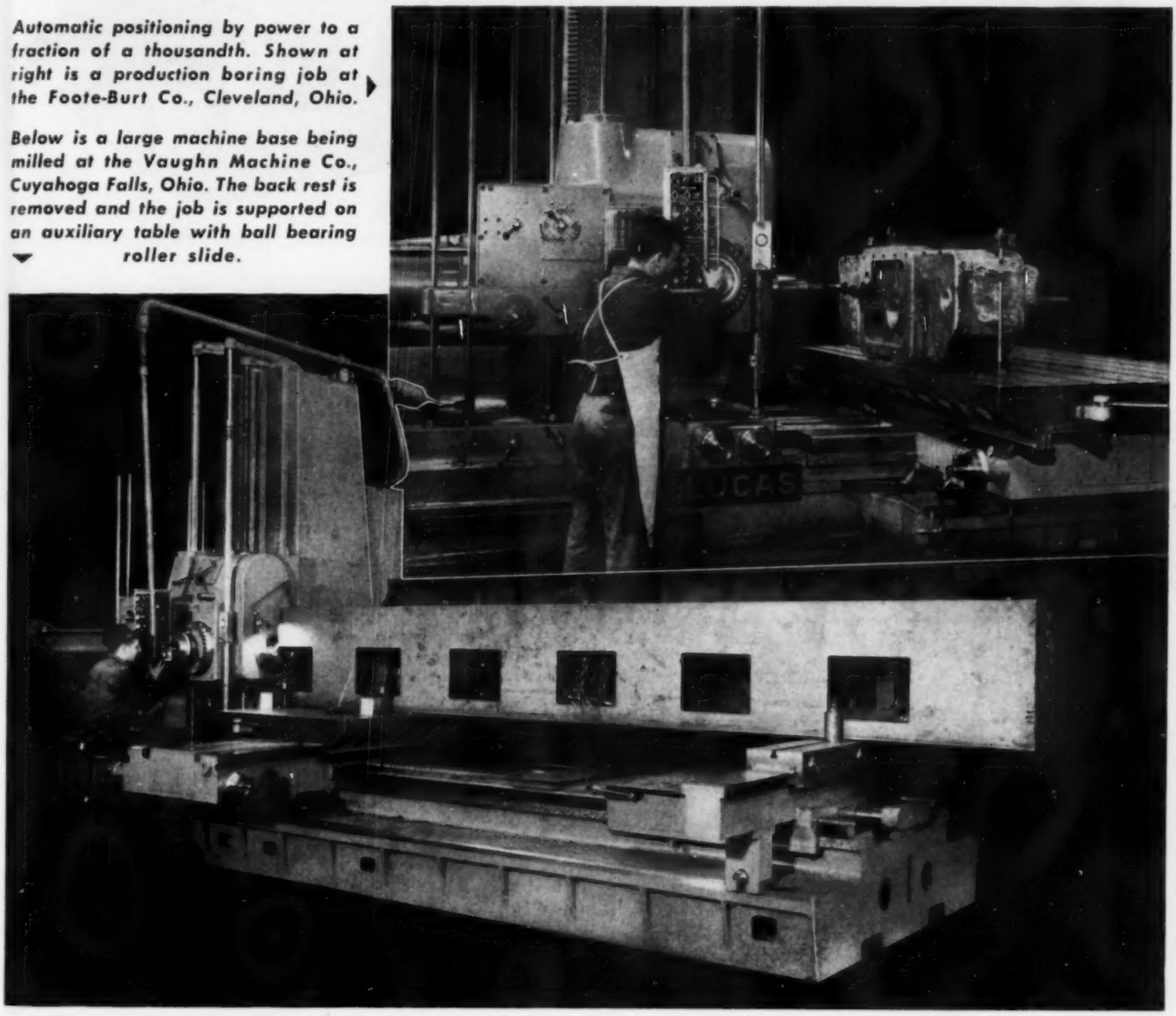
The LUCAS 584

5 Inch Horizontal Boring, Drilling and Milling Machine

Best for Production . . . Heavy . . . Precision Work!

Automatic positioning by power to a fraction of a thousandth. Shown at right is a production boring job at the Foote-Burt Co., Cleveland, Ohio.

Below is a large machine base being milled at the Vaughn Machine Co., Cuyahoga Falls, Ohio. The back rest is removed and the job is supported on an auxiliary table with ball bearing roller slide.



● Both jobs shown above require the highest degree of accuracy . . . Both meet production line standards! The Lucas 584 combines toolroom accuracy with quantity production capacity. This machine has multi-position, electric pendant directional control for spindle rotation, feed and rapid traverse selection for movement of any unit. High-low speeds to single spindle, multiple V-Belts for high speed, chatterless, vibrationless boring, drilling and milling. Rigid permanent covers are installed to protect the bed ways. Supporting sectional cross covers are for the operator to stand on and reach high jobs.

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Fine Pitch Mechanisms—produced to tool room standards . . . . . .

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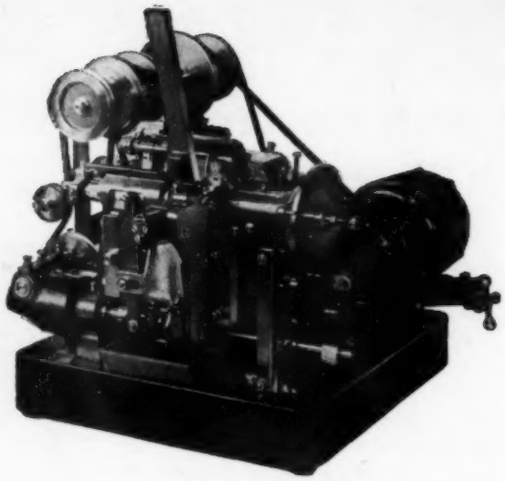

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PINION MACHINES

Diameter Capacity — Approx. 1/2 in.
Coarsest Pitch — about 32 D.P.

GEAR MACHINING

Pitch Diameter, Capacity 1 1/2 in.

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. . . . *takes work up to 7 inches*

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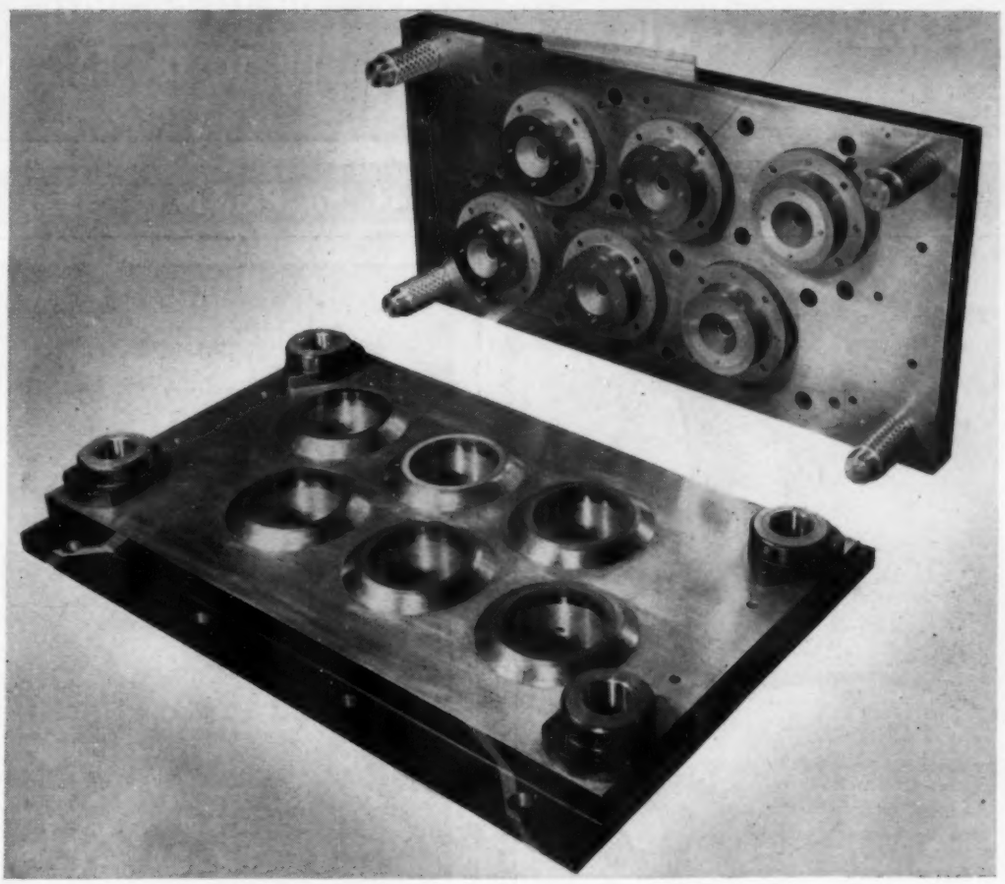

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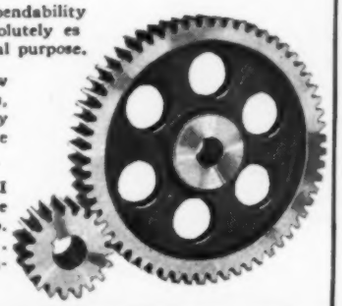

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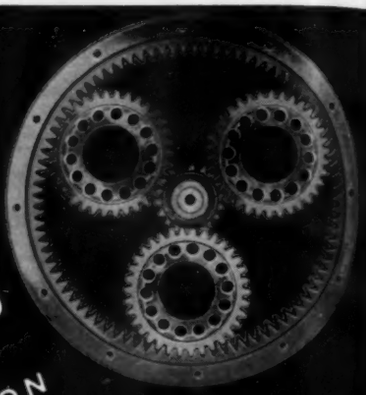

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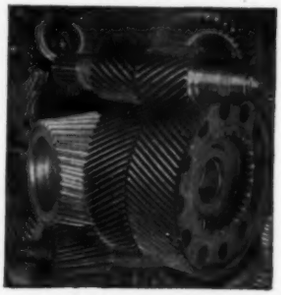

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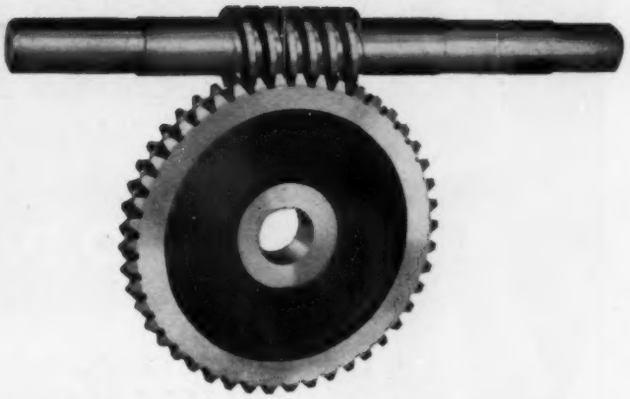

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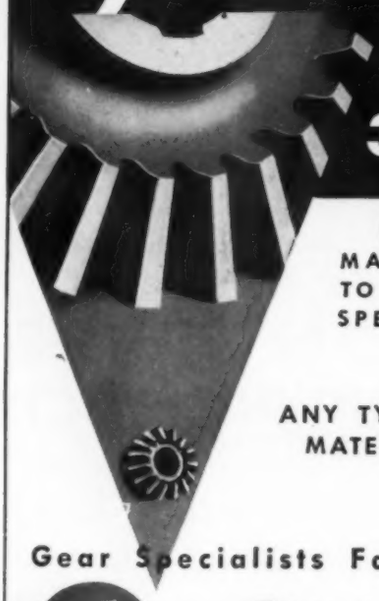

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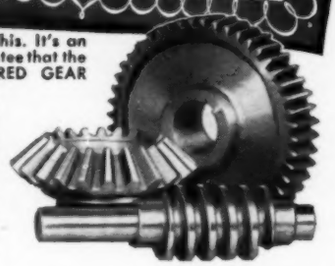

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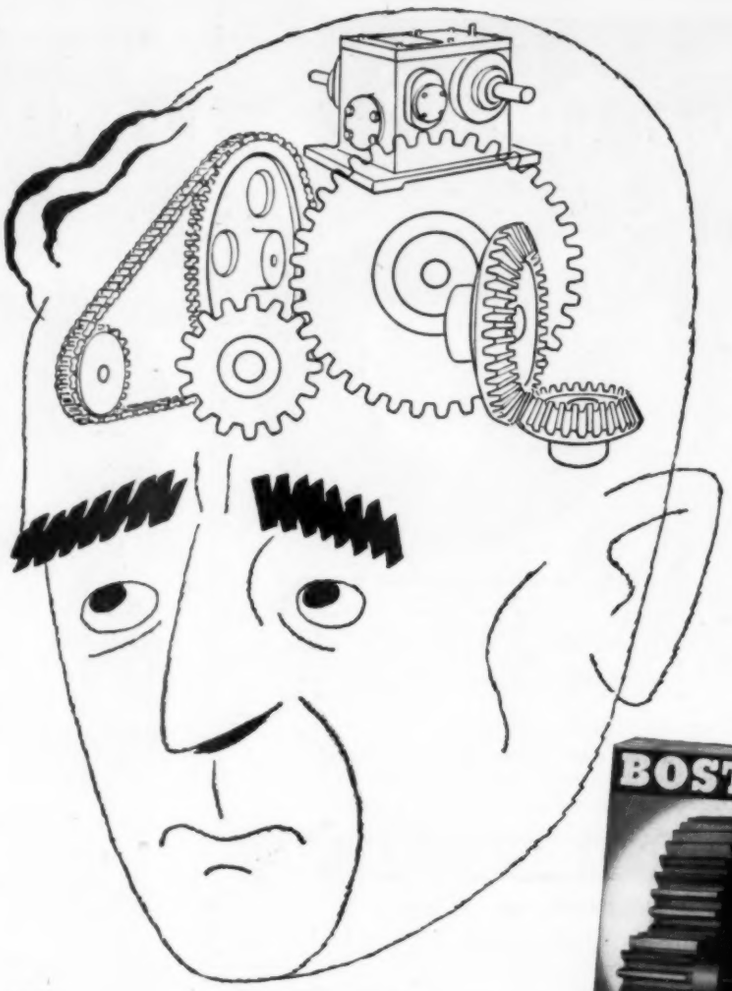

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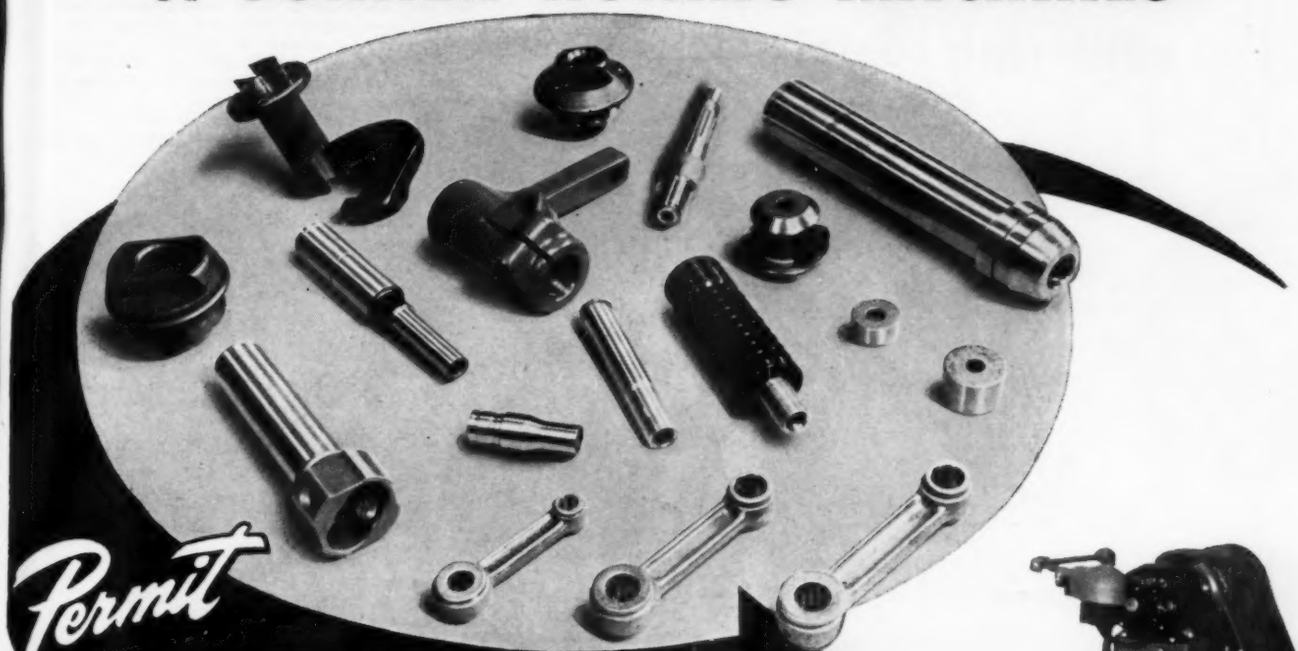

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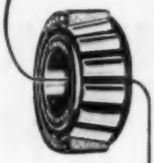

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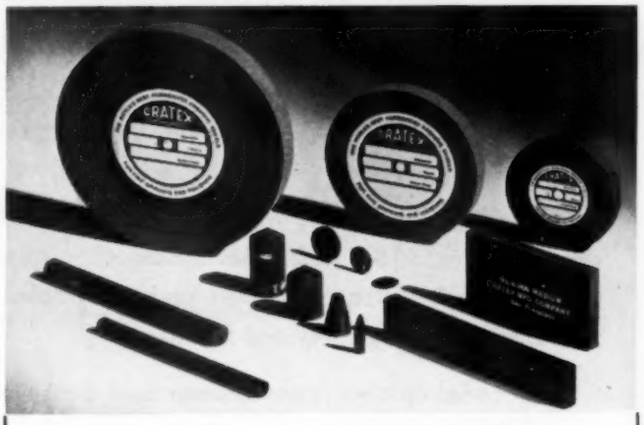

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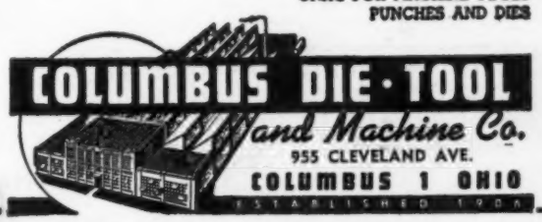

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BALL BEARING DRILLS

Walker-Turner Bench Type, m.d., latest
No. 1/2, 1, 2 Avey, m.d.
No. 1B Edlund, m.d., new
No. 5M—16" Fosdick, m.d., tapping
Providence Model E, belt
2 spindle No. 3 Avey, m.d., p.f.
2 spindle No. 3 Avey, m.d., tapping
2 spindle No. 3 Edlund, m.d.
3 spindle No. 2 Motor Avey type MA 6, p.f., latest
4 spindle No. 2 Avey MA 6, m.d., 2 tapping, latest
4 spindle No. 2 Avey, belted m.d.
4 spindle Gardam, belt

HORIZONTAL DRILLS

No. 1 Pratt & Whitney 2 spindle Deep Hole, m.d.
No. 1B—50" Pratt & Whitney 2 spindle Deep Hole, m.d., latest
No. 1 1/2x105" Pratt & Whitney 2 spindle Deep Hole, m.d., latest
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic, belt
Morris Horizontal Drill & Tapper, m.d., late

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, bushed for 34 spindles, equipped with 15
No. 3 Baush, 20x40" head, as above
P7 Baush Hydraulic, m.d., 20x30" head
D13H Natco Hydraulic, 18x12" head, bored for 24 spindles
No. 16 Fixed Center Foote-Burt, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, No. 4 Taper

RADIAL DRILLS

3'-9" American Triple Purpose, m.d. on arm
3' American Sensitive, belt
4'-13" American Triple Purpose, m.d. on base
4' American Sensitive, m.d. on arm
4'-12" Fosdick, gear box on base
4' Niles-Bement-Pond Semi-Universal, m.d. on base
5'-13" American Triple Geared, gear box
5'-15" American Triple Purpose, gear box on base
5'-13" Cincinnati-Bickford, m.d. on base
5'-15" Cincinnati-Bickford Super-Service, m.d. on arm
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5' Cincinnati-Bickford Full Universal, gear box
5' Prentice, m.d.
6'-15" Carlton, m.d. on base
6' extended to 7' Cincinnati-Bickford, m.d. on base
7' Dreses, gear box on base, 17" col.
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d. on base
8'-16" American Triple Purpose, m.d. on arm
8'-19" American Triple Purpose, m.d. on arm, late
10'-22" American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

20" Barnes All Geared Self-Oiling, m.d., tapper
21" Cincinnati-Bickford Super-Service, m.d.
24" Cincinnati-Bickford, belt, tapper
24" Cincinnati-Bickford, belt
28" Cincinnati-Bickford, m.d., tapper
30" Rich H.D., m.d.
40' Aurora, m.d.
H3 Barnes Hydram, m.d.
D4 Colburn H.D., s.p.d.
D8 Colburn H.D., s.p.d.
No. 36HO Baker, m.d., with 40" circular table
No. 217 Baker H.D., s.p.d.

GEAR SHAPERS

No. 6, 61, 645 Fellows, belt
No. 7A, 71A Fellows H.S., m.d.
No. 18 Fellows Finishing Machine m.d.
No. 61A, 615A, 65A3, 645A Fellows, m.d., latest type
No. 64-S Fellows, m.d.

GEAR GRINDERS

No. 13LS Fellows Lapper, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Hydraulic for Spur & Helical gears
No. 2HS Lees-Bradner Spur & Helical, m.d.

GEAR HOBBING MACHINES

Barber-Colman Model T, m.d., latest
No. 12H Gould & Eberhardt Universal, m.d.
No. 34 Brown & Sharpe Spur, m.d.
No. 44 Brown & Sharpe Spur & Helical, m.d.
No. 36H Gould & Eberhardt, with infeed for worm gears
48" Cleveland, m.d.

GEAR CUTTERS

3" Gleason Straight Bevel Gear Generator, m.d.
12" Gleason Straight Bevel Gear Generator, m.d.
No. 3—26" Brown & Sharpe Auto. Spur Gear Cutter, m.d.
No. 4—48" Brown & Sharpe Auto. Spur Gear Cutter, m.d.
No. 6—60" Brown & Sharpe Auto. Spur Gear Cutter, m.d.
No. 6—72" Brown & Sharpe Auto. Spur Gear Cutter, m.d.
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Gleason Spiral Bevel Gear Rougher, m.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
Cross Gear Tooth Rounder, m.d.
National Broach & Machine Co. Red Wing Gear Speeder, m.d.
Gleason Gear Tester, m.d.

CENTERLESS GRINDERS

No. 3 Cincinnati, m.d., Filmatic Spindle, latest
No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, m.d., cap. 3/8" valve stems

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., new, 15" spindle, latest
No. 50 Heald Hydraulic, m.d., 18" spindle
No. 73 Heald Airplane Cylinder, m.d., new, latest

DISC GRINDERS

No. 4 Gardner, m.d.
No. 20 Gardner Comb. B.B. Disc Grinder & Roll Sander, m.d.
Standard Elec. Tool Co. 7 1/2 H.P. Double End Disc, new
7 1/2 H.P. United States Double End, new

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THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

View of one warehouse bay — 700' long

PLAIN CYLINDRICAL GRINDERS

3x18" No. 5 Brown & Sharpe, m.d., latest
6x18" Cincinnati Hydraulic, m.d.
6x18" Landis Type C Hydraulic, m.d., latest
6x18" Landis, m.d.
No. 10 Brown & Sharpe, s.p.d.
No. 11 Brown & Sharpe, s.p.d.
6x30" Cincinnati Hydraulic, m.d.
6x32" Fitchburg Type A, m.d., latest
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" No. 16 Brown & Sharpe, belt
10x72" Landis, m.d.
12x36" Landis, m.d.
12x48" Cincinnati Self-Contained, m.d.
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Self-Contained, m.d.
14x48" Cincinnati Self-Contained, m.d.
14x52" Norton, motorized
14x72" Cincinnati Self-Contained, m.d.
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, with gap, m.d.
26x96" Landis Self-Contained, m.d.

UNIVERSAL CYLINDRICAL GRINDERS

No. 1 Brown & Sharpe, m.d., latest
12x24" Cincinnati Self-Contained, m.d.
12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., late
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati Hydraulic, m.d., latest
12x48" Cincinnati Self-Contained, arr. for jump grinding of splines
12x48" Norton Hydraulic, m.d., latest
16x48" Cincinnati, belted m.d.
18x48" Cincinnati Hydraulic, m.d., latest

TOOL & CUTTER GRINDERS

No. 2 LeBlond, m.d., latest
Sterling Tool, m.d., latest
No. 3 Gallmeyer & Livingston, m.d.
Cincinnati Monoset, m.d.
Gleason Cutter, belt
No. 2B Sellers Drill, m.d.
No. 4T Selers Tool, m.d.
No. 51 Oliver Drill, m.d.
Grand Rapids Tap, style 12M, m.d.
Gleason Cutter, m.d.

INTERNAL GRINDERS

No. 172 Heald Gap, m.d., new, never set up, latest
No. 6, 10, 20 Bryant, belt
No. 16A—16" Bryant, m.d., late
No. 16—22" Bryant Hydraulic Hole, m.d., late
No. 16—38 Bryant, m.d., late
No. 16RS Bryant, m.d., late
No. 24—21" Bryant, m.d., late
No. 49 Heald Single End Boremetic, m.d.
No. 70 Heald, belt
No. 72A Heald Plain, m.d.
No. 72A3 Heald Sizematic, m.d., late
No. 72A5 Heald Long Bed Type, m.d., late
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane Cylinder, m.d., new
No. 74 Heald, m.d.

SURFACE GRINDERS

No. 2 Brown & Sharpe, m.d.
No. 10 Blanchard, m.d., 16" chuck
No. 11 Blanchard, m.d., 16" Chuck, latest
No. 16 Blanchard, m.d., 26" chuck
No. 16 Blanchard, m.d., 30" chuck
No. 22—12" Heald Rotary, m.d.
No. 25A Heald—16" Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, m.d.
10x12x60" Norton Hydraulic, m.d., late
14" Pratt & Whitney Vertical, m.d.
18x72" Thompson Type C Hydraulic, m.d., late
22" Pratt & Whitney Type B Vertical, m.d.
24"x28"x144" Thompson Hydraulic, m.d., with chucks, latest
54" Bridgeport Knife, belt
30"x18"x6' Springfield Planer Type, m.d.

THREAD GRINDER

No. 33 Excello, m.d., latest

SHAPERS

16" Gould & Eberhardt, cone
24" Potter & Johnson, cone
24" Gould & Eberhardt, gear box

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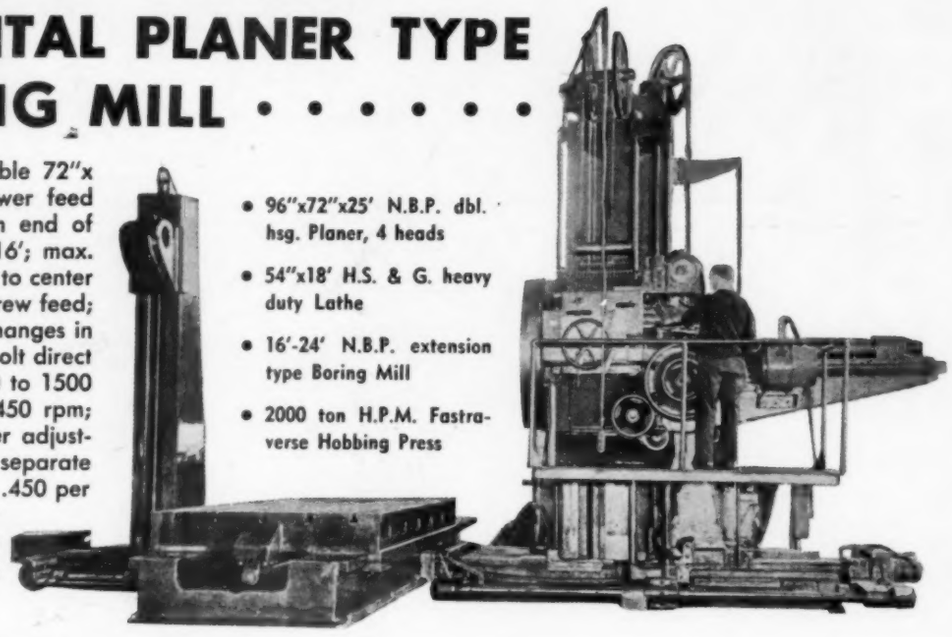
7" DETRICK & HARVEY

HORIZONTAL PLANER TYPE BORING MILL • • • • • •

● Working surface of table 72"x 144"; Travel of table power feed 10'2"; max. distance from end of spindle to outer support 16'; max. distance from top of table to center of spindle 8'2"; Bar has screw feed; has 4 mechanical speed changes in gearbox and 35 HP, 220 volt direct variable speed motor, 500 to 1500 rpm; spindle speed 1 to 450 rpm; outer support has 5' power adjustment on outer way with separate motor; feed range .010 to .450 per rev of spindle; with power feed in all directions to table and head on upright.



- 96"x72"x25' N.B.P. dbl. hsg. Planer, 4 heads
- 54"x18' H.S. & G. heavy duty Lathe
- 16'-24' N.B.P. extension type Boring Mill
- 2000 ton H.P.M. Fastraverse Hobbing Press

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LATE MODEL MACHINE TOOLS FOR EARLY DELIVERY

BORING MILLS

36" & 42" BULLARD Vert., M.D. Spiral Drive
No. 44 UNIVERSAL "Tri-Way", Table Type

CYLINDRICAL GRINDERS

No. 4H LANDIS 4"x18" Plain Grinders
6"x18" NORTON & LANDIS Type C Plain, M.D.
6"x30" NORTON Type C Plain, M.D.
10"x72" NORTON Type C Plain, M.D.
12"x48" CINCINNATI Model ER Univ., M.D.
14"x30" LANDIS Type C Plain, M.D.
24"x90" NORTON Plain, M.D.

SURFACE GRINDERS

No. 2 REID Surface, M.D.
6"x10"x18" THOMPSON Type "F" Hyd., M.D.
14"x16"x60" THOMPSON Type "O" Hyd., M.D.
No. A3—18" ARTER Rotary, M.D.
No. 11 BLANCHARD Rotary, 16" chuck, M.D.

GRINDERS (Misc.)

No. 10 B & S Cutter & Tool, M.D.
No. 2 CINCINNATI Cutter & Tool, M.D.
No. 4T SELLERS Tool, M.D.
No. 72A3 HEALD Plain Internal, M.D.
9" P & W Hyd. Gear, M.D.
No. 48-C EXCELLO Carbide Tool, M.D.
No. ND-10 HAMMOND Grinder, M.D.

LATHES

AMES Precision Bench Lathe, 1" cap., M.D.
No. 820 LOGAN GCG Lathe, M.D.
14"x30" cc LeBLOND Heavy Duty, M.D
16"x30" cc MONARCH Model "C" Toolroom, M.D.
20"x48" cc MONARCH Model "M" Engine (2)
50"x17' cc LeBLOND "BIG SWING", M.D.

MILLING MACHINES

No. 2G KEMPSMITH All Geared Univ., M.D.
No. 2HS CINCINNATI Dial Type Vert., M.D.
No. 2H KEARNEY & TRECKER Vert., M.D.
No. 4MS CINCINNATI Dial Type Plain M.D. (2)

PRODUCTION MILLERS

No. 08 CINCINNATI Hor. & Vert., M.D.
No. 2-24 CINCINNATI Auto., M.D.
No. 1224 KEARNEY & TRECKER Simplex, M.D.
No. 1848 KEARNEY & TRECKER Simplex, M.D.
No. 12B P & W Two Spindle Profilers, M.D.
No. M50A TAYLOR & FENN Vert., M.D.
No. 45/48 CINCINNATI Plain Hydromatic, Tracer Control.
No. 5/60 CINCINNATI Duplex Hydro., tracer control mechanism for auto. rise and fall of spindle carriers, M.D.

TURRET LATHES

No. ESM-59 HARDINGE Hand Screw, M.D.
No. 0 B & S Wire Feed Screw, M.D.
No. 2G MOREY Turret Lathe, M.D.
Nos. 3 & 4 GISHOLT Ram Type Univ., M.D.
Nos. 3, 4 & 5 WARNER & SWASEY Ram Type Univ., M.D.
Nos. 3 & 5 JONES & LAMSON Ram Type Univ., M.D.
Nos. 2A & 4A WARNER & SWASEY Saddle Type Univ., M.D.

DRILLS

20" BARNES "Camel Back" Upright Drill.
No. 263 BARNES Heavy Duty Upright Drill
Type MAS AVEY 4 spdle. Floor Type, M.D.
6-spdle ALLEN 5 powerfeed spindles, belted M.D.
3'9" CINCINNATI BICKFORD "Super Service" Radial
No. 3 Type MAS AVEY Single Spindle, M.D.

MISCELLANEOUS

LINDBERG Type HYT Tubulaire Hydryzing Furnace
Type B6 PORTER CABLE Belt Sander

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#2 LMS Leland Gifford Single spindle floor drills 220/3/60

36" Fellows Gear Shaper, 3 step cone

U. S. Multi-Millers 220/3/60

6 x 20 Pratt & Whitney Thread Miller S. P. D.

#4 Fellows Enveloping Gear Generator 220/3/60

#5 BM Fosdick Floor Drill 220/440/3/60

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Tioga, Livingston and Almond Streets
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No. 12 Morey 2-spindle Profilers
No. 25 Foote-Burt Drill
No. 4 W & S Turret Lathe

MDNA MEMBER

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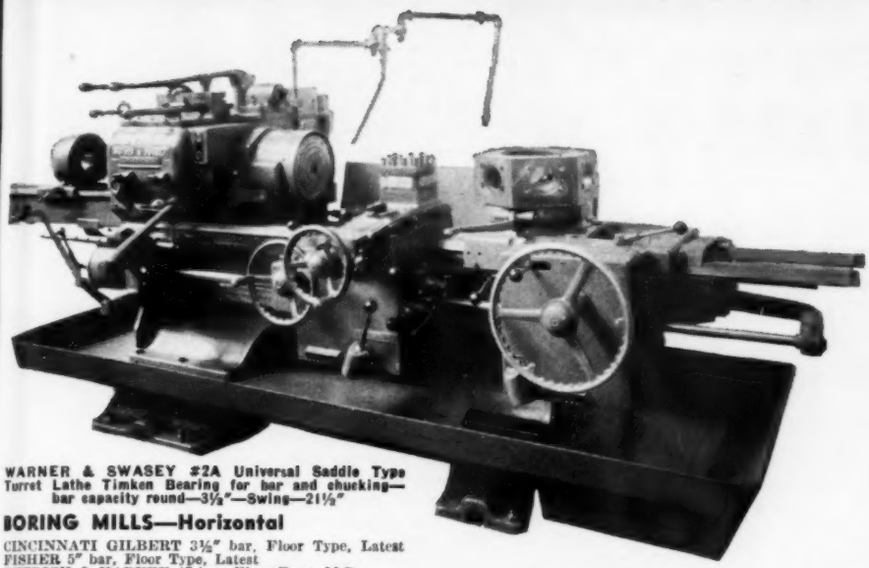
LATEST TYPE NEARLY NEW MACHINES



WARNER & SWASEY #2A Universal Saddle Type Turret Lathe Timken Bearing for bar and chucking—bar capacity round—3½"—Swing—21½"

BORING MILLS—Horizontal

CINCINNATI GILBERT 3½" bar, Floor Type, Latest
FISHER 5" bar, Floor Type, Latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
EXCELLO #112C single end, Borers, Latest
GIDDINGS & LEWIS #25, 2½" bar, M.D.
GIDDINGS & LEWIS #32, 3½" bar, M.D.
HEALD #48A Single End, 2-spindle, Latest Type
HEALD #49 Universal, Single End, Latest Type
LANDIS #35, 3½" bar, Floor Type, M.D.
NILES BEMENT POND 4½" bar, M.D.
NILES BEMENT POND 5", 6" bar, Floor Type, M.D.
P & H #10 3½" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed, Latest Type
UNIVERSAL No. 3A, 3" bar, M.D.

BORING MILLS—Vertical

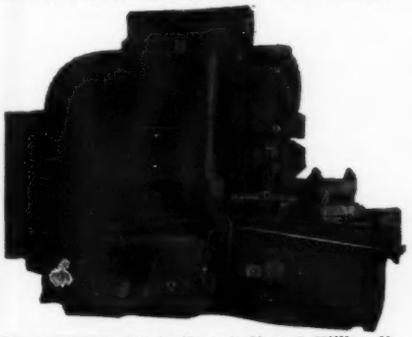
BETTS 120", 2 swivel heads, AC, M.D.
BULLARD 16" 6-spindle Type D Multimatic; latest type
COLBURN 72"—2 swivel heads, A.C., M.D.
KING 36" Vertical Turret, M.D., Latest Type
KING 62"—2 swivelheads; P.R.T.—M.D.
NILES 72", 84", 100", 2 swivel hds., M.D.

GEAR CUTTING EQUIPMENT

BARBER COLMAN #12 hobber, M.D.
BARBER COLMAN No. 3 hobber—latest type
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS #615A, #61, #645A3, #7A, #72, #64, #61A, #77 High Speed Gear Shapers; latest type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #6Z2 Gear Shaper; high speed; latest type
FELLOWS #13LS Lapper, latest type
GLEASON 5", straight bevel generator, Latest Type
GLEASON #7 hypoid, spiral, bevel, zerol, Latest Type
GLEASON #20 Spur Gear Tester, latest type
GLEASON #4, #6, #13, #18 Bevel and Hypoid Tester
GOULD & EBERHARDT 96 H Hobber with Diff., M.D.
GOULD & EBERHARDT 12HS hobber, Latest Type
PFAUTER #1, #2 universal hobber, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type



SUNDSTRAND #3 Profile and Channel Milling Machine 22" Rotary Table M.D., Latest Type

BROWN & SHARPE #20 10x18 plain, latest type
CINCINNATI 6"x18" Plain, Model EA, Hyd., latest
LANDIS 10"x24" Type C, Universal, Hyd., Latest
NORTON 10x18 Type C M.D.
NORTON 16x72 Plain Type "C", latest type

GRINDERS—Miscellaneous

BARBER COLMAN #3 Hob Sharpener; latest type
BRYANT #5, #16-16, #16-CP-16, #24 Internal Hydraulic, latest type
CINCINNATI #2 Plain Cutter and Tool, Latest Type
CINCINNATI #2 Centerless: latest type
COVEL #22 Universal Tool & Cutter, Latest
HEALD 75A, 72A3, 81 Internal; latest type
JONES & LAMSON 6x15, 8x48, Auto. Thread, latest

GRINDERS—Surface

BLANCHARD #16, 24" chuck, M.D.
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #11, 16"; Latest Type
G. & L. #55, 12x36 hyd., latest type
HEALD #22 Rotary, 12" chuck, latest type
MATTISON 14x16x60 hydraulic, latest type
MATTISON 16"x24"x72"—Hyd., Latest Type
NORTON 6x18 Hydraulic; latest type
THOMPSON 16x30x48 hydraulic, latest type

JIG BORERS

VERNON Precision, M.D. Latest
PRATT & WHITNEY #1A M.D.
PRATT & WHITNEY #3B Model 4854, Latest Type

LATHES—Engine and Mfg.

BARNES #420, 2 spdl. deep hole drill, Latest Type
BAUSH 1¼"x36" 2 spdl. deep hole drill and borer
BRIDGEFORD 36"x32' bed—2 carriages
FAY & SCOTT 28/60x12' centers Sliding Bed Gap, M.D.
HARDINGE TR-59, Latest Type
HENDEY 12x54" centers, M.D.
JONES & LAMSON "Fay" 20x25" automatic, latest
LeBLOND #2 deep hole borer, Latest Type
LeBLOND 17x5', 20"x10' bed, RP, Timken, Latest
LEHMANN 16x30" centers, TIMKEN, latest type
LIPE 16x30 centers Carbo-Matic Hydraulic, Latest
LODGE & SHIPLEY 18x72 centers, M.D.
LODGE & SHIPLEY 36"x144" centers; geared; M.D.
LoSWING 4x60, 4x84, 8x60, 8x198, 5x34, Latest
MONARCH 12x30" centers; Timken; latest type
MONARCH 16x28" geared-head, M.D.
MONARCH 10"x20" centers, Model EE, Timken, latest
MOREY Model A 8"x120" shaft turner, Latest Type
NILES 90x110 centers Car Wheel, M.D.
NILES 42"x60" double head, M.D.
NILES 60x10' centers, PRT, Latest Type
NILES 30x50' Boring, Timken, Latest Type
NILES 48x87' centers, 72x62' centers combination boring and tooling, M.D.
PRATT & WHITNEY ½Bx30", 2 spindle, Deep Hole Drill, latest
PRATT & WHITNEY 10"x20" centers Bench, latest
REED PRENTICE 16x24" centers, geared head, M.D.
SPRINGFIELD 14"x6' bed, geared head, M.D.
SPRINGFIELD 16"x6' bed, geared head, M.D.
SUNDSTRAND 8x15 Style D, 8x21 Style E Automatic Stub, Timken, Latest Type
WARD, HAGGAS & SMITH—18/30x66" centers gap,

LATHES—Turret

BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4, #5 univ., TIMKEN, Latest Type
JONES & LAMSON #3, #5, #8A Univ., Timken latest
LIBBY No. 1H-5 Timken Bearing—latest—3½" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON 5D2E, Auto., Timken, latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY #1A, Univ., Timken; latest
WARNER & SWASEY 2A, Univ., Timken, Latest

MILLING MACHINES—Mfg.

INGERSOLL 42"x38"x12' adj. rail, 4 heads, A.C., M.D.
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x30x12' adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex, latest type
TAYLOR & FENN M80 Duplex Spline, latest

MILLING MACHINES—Plain

BROWN & SHARPE #2B, #3B, TIMKEN, Latest
CINCINNATI #4 TIMKEN, M.D.
CINCINNATI 3S, 4S, 5, M.D.
CINCINNATI 4-36 hydromatic, Latest Type
KEARNEY & TRECKER 121S, TIMKEN, latest
KEARNEY & TRECKER #3, 4, Heavy Timken, M.D.
KEMPSMITH #4 Maximiller, Timken, latest type
SUNDSTRAND #2 Electro-mill, Latest Type

MILLING MACHINES—Universal

BROWN & SHARPE #3A, M.D.
CINCINNATI #3 Universal, Dial Type, Timken, latest
KEARNEY & TRECKER #3B, M.D.
KEARNEY & TRECKER 3H, Timken, latest
KEMPSMITH #4 Maxi-Miller, Timken, Latest
VAN NORMAN #12, TIMKEN, Latest Type

MILLING MACHINES—Vertical

CINCINNATI #2, #3, #4 Dial Type; Timken; latest
GORTON #9J with Duplicator, Latest
REED PRENTICE 3VG with Hydraulic Duplicator Timken Bearing, Latest Type
SUNDSTRAND #3A, rotary, Latest Type

PLANERS

BETTS 96"x96"x20'—4 heads, PRT, Box Table, M.D.
CHANDLER 36x36x20', 4 heads, AC, M.D.
CINCINNATI 120"x96"x26'—4 heads, Box Table, M.D.
CLEVELAND 48"x60"x20' Openside; 3 heads; A.C. M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
GRAY 36"x36"x8'—2 heads, Max. service, D.C., M.D.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
NILES 54"x54"x18'—4 heads, Box Table, M.D.
NILES 72"x72"x25'—4 heads, Box Table, M.D.

PRESSES

BIRDSBORO 325 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton, vert. hydro-pneumatic
CHAMBERSBURG 200 ton horiz. straightening, M.D.
CLEARING Type DS-1125-32 dbl. action 125 ton, Latest Type
FERRACUTE #DG-55, 75 ton drawing, Latest Type

MISCELLANEOUS

BARNES #172, 306H, 307 Vertical Hone, latest type
BILLINGS & SPENCER 1500 lb. Board Drop Hammers
BROWN & SHARPE #4 High Speed ASM, Latest
CINCINNATI 1-30, 3-30 Duplex, Vertical, Surface, Double Ram Broach, Model ER, Hyd., Latest
CLEVELAND 12"x16' centers—Cutter Reliever, M.D.
La POINTE SRV-10-54 Vert. Surf. Broach Hyd. Latest
MORTON 60" combination traveling bd., planer, miller and borer, M.D.
NAZEL #4B Pneumatic Hammer, M.D.
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, latest type, 2 & 3 Dimensional
PRATT & WHITNEY (KELLER) Type G Copying; latest type 2 Dimensional

REED PRENTICE #5 Vertical Miller and Die Sinker Table 16x68

Available for Prompt Shipment ***Most Built After 1941***

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

MOREY MACHINERY CO., INC.
410 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

ALL LATE TYPE EQUIPMENT

. . . SUBJECT TO PRIOR SALE

GRINDERS

12"x36" NORTON—Universal—Multi-Purpose—Type C—1941
6"x18" NORTON—Plain cylindrical—Hydr.—Type C—1941
#2 CINCINNATI—Tool & Cutter—Plain—1942
#2 CINCINNATI—Centerless—"Filmatic"—1942
#2 BROWN & SHARPE—Surface—6"x18"—1943
#A3—12" ARTER—Rotary Surface—12" chuck—1944

LATHES AND TURRETS

14"x30" LODGE & SHIPLEY—12 speed—1942
14"x54" REED PRENTICE—AA—GH—16 spd.—1941
20"x54" REED PRENTICE—AA—GH—16 spd.—1942
13"x5' LEBLOND—Rapid Production—1942
#5—GISHOLT—Universal Turret—Chucking—1943
#3 WARNER & SWASEY—Universal Turret—Chucking—1942
#2 BROWN & SHARPE—Wire Feed—Hand Screw—Power Fd. to Turret—1942
#2G MOREY—Bar feed or chucking—1942

MILLING MACHINES

#2 BROWN & SHARPE—Plain Horiz.—Light Type—1942
#2K K & T Milwaukee—Plain Horiz.—1943
#3H K & T Milwaukee—Plain Horiz.—1942
#3K K & T Milwaukee—Plain Horiz.—1943
#7B FRAY—Vertical Universal—Back Geared—1942 ser.
#3H K & T Milwaukee—Vertical—1942
#MM1-6 U.S.—Multi—Miller—Production—1942
NICHOLS—Hand—motors—pump—1941
#1 UNITED STATES—Hand 220/3/60—1942
#0-8 CINCINNATI—Horizontal—Plain or Rise and Fall

MISCELLANEOUS

#4BM—12" FOSDICK DRILL—2 spindle—1941
#3B STANDARD PRESS—25 Ton—OBI—RL Fd.—1945
#12B PRATT & WHITNEY PROFILER—2 spindle—1941
#00G BROWN & SHARPE SCREW MACHINE—over 17,500
#40 LEES BRADNER THREAD MILLER—Auto.—1941
#CT-36" LEES BRADNER THREAD MILLER—Fast Index—1942
7½" GOSS & DeLEEUW CHUCKER—6 spindle—1945
8"x16" KALAMAZOO SAW—Band—M.D.—1944

OTHER DESIRABLE EQUIPMENT

BORING MILL—Universal—3" bar—MD
CUT-OFF MACHINE—Tabor—Abrasive—Type DAC-14" wheel
GEAR CUTTER—Henry J. Reuson—#6—72" Spur.
DRILLS—Canedy-Otto—Bench—NEW
GRINDER—Cincinnati—Tool and Cutter—Plain—1935
GRINDER—Norton—Cam—10"x24"—Mtzd.
HOOP FLARER—E. B. Holmes—#20½—Floor Model.
LATHE—Hendey—14"x6'—Geared Head—Factory MD
LATHE—Monarch—14"x8'—Engine—BG—Mtzd. Collets
LATHE—Whitcomb-Blaisdell—20"x5'—QCG—BD
LATHE—Warner & Swasey—Turret—#2—PF to Turret—Arr. MD
MILLING MACHINE—Milwaukee—#1—Pl. Horiz.—Mtr. in base
MILLING MACHINE—Becker—#5—Vertical—BD
PLANER—Hendey 16"x16"x48"—T & L Pulley Drive
PLANER—Whitcomb—24"x24"x6'—Arr. MD
PRESS—Bliss—50 Ton—OBI
SAW—Cochran-Bly—#4B—Ins. Tooth—MD
SPRING COILER—Sleeper & Hartley—#2
SCREW MACHINE—Brown & Sharpe—#0—Fully Auto.—BD
SCREW MACHINE—Brown & Sharpe—#0G—Ser. No. 7500
SCREW MACHINE—Brown & Sharpe—#00G—Ser. # over 11,000
SCREW MACHINE—Acme—1 spindle—3¼"—Automatic—BD
SHAPER—American—28"—SPD—Back Grd.
SHAPER—GOULD & EBERHARDT—24"—4 Spd. Drive
SHAPER— Stockbridge type—16"—Crank—CD
SUPERFINISHER—Foster
WELDER—Pier—Model 82—12-10 KVA

UNITED MACHINERY & TOOL CORP.

34 HERMAN STREET **WORCESTER 8, MASS.**

UNITED MACHINERY AND TOOL CORPORATION — UMTC

FOR SALE

#11 Cochrane-Bly saw and saw sharpener, with 7½ HP 220/440/60 motor, late model good condition $2250.00

#PG-6 Ferracute punch press, geared 1¾" stroke, bed area R to L by F to B 34¾"x 23". Opening in bed R to L by F to B, 16"x14". Slide adjustment. Height overall 103" $2750.00

#2 Cincinnati centerless grinder, filmatic spindle, serial #2M-2H1L-9, late model $2350.00

#5 Waterbury-Farrel blanking and cupping press, 4" stroke, open back, 25"x12" bed area, app. 20 ton cap., adjustable ram, ½ HP motor $380.00

#35P Toledo punch press, gap type flywheel 48"x 7", bed size 27"x18", stroke 1⅜", 15" from bed to bottom of ram ways. 10 HP motor, Pitman strap and eccentric just rebuilt $1500.00

Hayes electric heat treat furnace, type HG64, with controls, serial #3496 ..... $350.00

U. S. Multimiller, model MM-1-5-2. Table 6"x 2½", automatic vertical motion of spindle head 2" horizontal adjustment of spindle assembly 2¼" motorized, automatic lubrication system, Coolant pump and tank, little used late model machine $750.00

#3 Waterbury-Farrel punch press, app. cap. 20 ton, stroke 2½"; ram adjustment, 60 strokes, per min., shut height 6½", bed size F to B 10½ R to L 14½", 1 HP motor, like new $475.00

Model RA-6 six-spindle Asme-Gridley automatic, 9/16" bar cap., including tooling and equipment, serial No. 2237A, practically new $4550.00

6" Avey stock cutting band saw, late model (exceptional machine) $770.00

Conveyer approximately 100 feet in 8 to 10 ft. lengths ..... $3.50 per ft.

Presses, Waterbury-Farrel tapering, double crank ram adjustment, 4" stroke, with cam gate knockout, 28" flywheel, not motorized, app. 25 ton cap. $400.00

BILLARD MACHINE & TOOL CO.

PHONE 44 **MANSFIELD, PA.**

GEAR CUTTERS

NEW — H.S. STEEL • FIRST QUALITY

INVOLUTE 1P to 48P } *ALL LISTED*
BEVEL 3P to 24P } *PITCHES*

LESS 50% DISCOUNT

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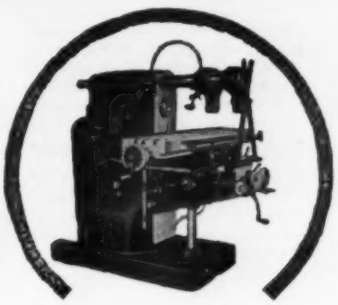
DeWITT TOOL CO. 173 Grand St., N. Y. 13, N. Y.

NEW — SURPLUS PRECISION TOOLS NEW SURPLUS

2" Rd. Leg Dividers, Starrett, $ .75 ea.
4" Spring Dividers, Millers Falls, .75 ea.
6", 8", 10" Spring Dividers, Union, 1.00 ea.
6" Ins. or Outs. L. J. Calipers Starrett, 1.00 ea.
6" Depth Gauges, Union, 1.00 ea.
8" Outside Calipers, Lufkin, 1.00 ea.
8" Inside Calipers, Millers Falls, 1.00 ea.
8" Herm. Calipers, Lufkin, 1.00 ea.
9" Combination Sets W/center & Square, 2.00 ea.
#47 Universal Bevels, Starrett, 1.50 ea.
Drill Gauges #1-60, Morse, 1.25 ea.
Fldg. Drill Stands 1/16"-½"x64, Morse, 2.25 ea.
24" Lock Joint Calipers, Ins. Starrett, 3.00 ea.

VICTOR MACHINERY EXCHANGE, Inc.
251 CENTRE STREET
NEW YORK CITY
CANAL 6-5575

AARON
AA VALUES IN MODERN TOOLS

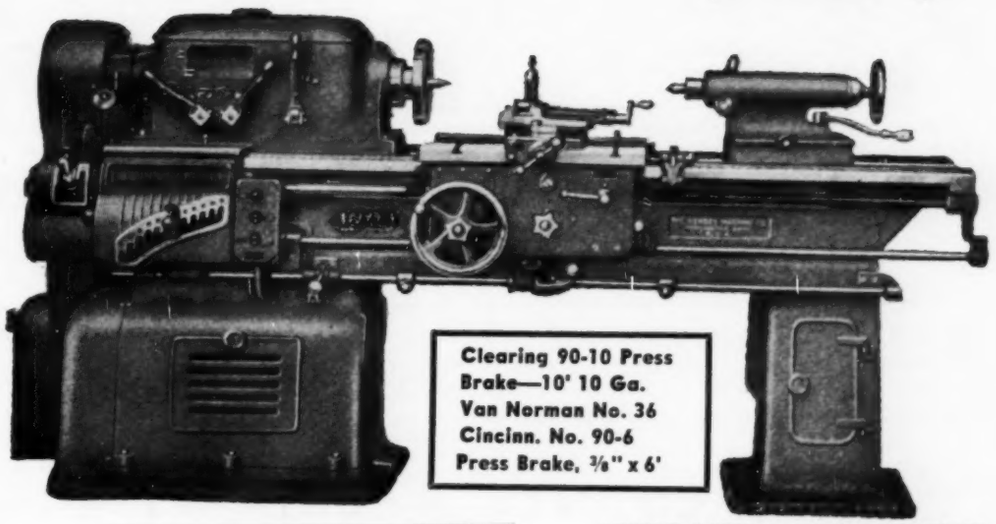


SCARCE LATE MACHINES

NBP 2500 lb. Single Frame Steam Hammer
Ferracute D.D.G. 56, #105 ton Double Action Cam Press.
Universal 3" boring mill, 1942
Gorton Duplicators and Vert. Millers, 8D, 9J
Gorton No. 3Z, ID, ME Engravers
Marvel 6A Hacksaw, M.D., Auto. Feed
Injection Moulders, Hydraulic Presses
Bakewell No. 1 Tapper
Abrasive 6x18, 8x24 Surface Grinders No. 3B, 34
Conomatic 1⅞" 8 spindle, Late
Brown & Sharpe #5 Grinder Cyl.
Thompson Seam Welder
Mod. 26 Rafter, New 1945
Conomatics 6 spdl. 2⅝", 1½" late, fully equipped.
Universal 3" Boring Mill
W & S Nos. 3, 4 Grd. Hd., Preselector
Gisholt No. 5, 1L, 2L Univ. M.D. Late
Acme #2 M.D., Foster 3B
Oster 601 Rapiduction, Late Tooling
Hardinge ESM, 2nd operation, late
Cincinnati 12x36" Univ. Grinder
Abrasive 3B 8"x24" Surf. #34 vert. Grinders
No. 18, 25 and 35 Gallmeyer and Livingston Hyd. Surface Grinders, 6x18, 8x24
#25A Heald, M.D., like new Rotary Surf.
B & S No. 2, 2B Surface, M.D.
Norton 6x18" Hyd. Surface, M.D.
Covel #91A Tool, New 1941, Cinn.
Hammond & Excello Carbide Grind Gardner #226 Disc
Monarch EE 10"x20" Hendey 12x30, G. H. Lathes
South Bend, M.D. 9x3½", 10x48' ea.
Sebastian 12"x4' grd. hd. late
Rivett No. 918 bench M.D., Hardinge Cabinet
Lodge & Shipley 16"x78" 12 speed Grd. Hd. lathe
Buffalo #0 Angle Roll, M.D., Excel #4
Bliss #58.0B Gap Presses 62, 62A, 162
Cincinnati 36" Univ. Shaper, Power Downfeed
Burke Miller Pl. & Univ., Nichols Hand
Delta Single & Multiple Drills
Oliver Heavy die Filer, 510 Drill Pointer
J & L bench comparator 14"
Taylor Winfield 50 DVA Spot Welder
Peerless No. 226, Eyeletting USMC
Hi Speed Hammers, all sizes
Cinn. #3 Pl., #4 Vert. Dial Type, Rect.
B. & S. #12 Elec. Prod. late type #21
Waterbury-Farrell #30 Thread Roller & Dies
Cinn. Bickford 24" Super Service Radial
V & O 102 Reducing Press, 25, 35 Ton OBI
Cinn. 1-12, 2-24 Production Mills
Pratt & Whitney 1 & 2 spindle Profilers
Stokes Tablet Press
Ball & Jewel Plastic Grinders

BORING MILLS

#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D., 2½", 4" Bimsee
Niles-Bement-Pond 4" duplex, Universal 3"
66" Niles; 54" Colburn M.D. 2 hds.
Bullard New Era 24", 42", King 42"



Clearing 90-10 Press Brake—10' 10 Ga.
Van Norman No. 36
Cincinn. No. 90-6
Press Brake, ⅜" x 6'

NEW IN STOCK

Power & Gap Shears—52", 72" & 96"
Spot & Arc Welders, 6x6" Racine Hacksaw
5, 7, 14, 18 & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
6x6" Racine Hacksaw
20 ton Northern Hydraulic Presses

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36"

GRINDERS

Surface Grinders, 6x18, 8x24
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.; 1, 3 Univ.

LATHES

Hendey 12x30, G.H. Lathes
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd., Late
Wade, Hjorth, Hardinge, P & W Precision Bench

AUTOMATICS

Cone 8 spindle, 1⅞" Late, 6 sp. 2⅝", 1½"
Cleveland Model A ⅞", 1¼", 2"; B 1", 2", ⅞"
Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto., #2 Hand

MISCELLANEOUS

Wiedman Turret Punch—Type R4P
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Pexto 6' Power Shears
Deckel G1, G2, G1F Engraving machine
Hanson Whitney Thread Miller, Planetary
Leland-Gifford 1, 2 & 4 spindles, Model MS

HYDRAULIC EQUIPMENT

2000 TON BIRDSBORO PRESS
Self Contained

60" between rods left to right, 53" front to rear. Overall length of platen left to right 144". Stroke 30". Opening 36". 60 H.P., 3 phase 60 cycle, 220-440 V motor.

1300 TON WATSON STILLMAN HYDRAULIC PRESS (Self Contained)

Platen size 48"x42". Stroke 22". Opening 46". Ram Diameter 35". Driven by 50 H.P. motor.

600 TON SOUTHWARK PRESS

Self contained 48"x48" platen size, 65" stroke, 110" opening, 50 H.P. motor, 3 phase, 60 Cycle, 220v.

1000 TON H.P.M. PRESS Self Contained

Platen 72"x48". 36" stroke, 38" opening 40 H.P., 3 phase, 60 cycle, 220-440 V motor.

500 TON LAKE ERIE PRESS

Platen 35"x36", 36" stroke, 68" opening, 150 H.P., 360-440 V. Motor.

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained.

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

MILLING MACHINES

3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3 Vert.
Taylor-Fenn Spline Miller

RADIALS

Carlton 8' Arm 19" col. M.D.
6' Cincinnati-Bickford
4', 5', 6' American Triple Purpose
Walker-Turner, ½" cap.

AAron Machinery Co., Inc.

MONA MEMBER

45 CROSBY STREET • NEW YORK 12, N. Y.

WO. 4-8233 CABLE—AARMACH, N. Y.

SEARCHLIGHT SECTION

ROLLS—BENDING—20′ x 1″ cap.—1938
Drop End—Pinch Type for full circle
75 H.P. & 35 H.P. Wt. 65 Ton

IRONWORKER—Pels #26 Universal
Punch 1¾″ thru 1″
Shear 6 x 6 x ¾″ Angles 15 H.P.
All Steel Wt. 10½ Ton

SQ. SHEAR—10′ x ¾″ cap.
With 15″ Gap—15 H.P. Wt. 10 Ton

PLANER—Niles Bement Pond
48″ x 48″ x 26′ Working Bed with 4 Heads
15 H.P. D. C. 230 V. Variable Speeds
Special Price—$7500.00

RADIAL DRILL—Cinc. Bickford
7′ x 15″ Round Column
D. C. Drive—Special Price—$2750.00

LATHE—Engine—Betts—Bridgeford 1942
60″ Swing x 30′ Centers x 40′ Overall double compound each motor 5 H.P.
40 H.P. D. C. 230 Volt Like New

BORING MILL VERT.—BETTS 112″—1942
2 Fixed Heads on Rail
A. C. with D. C. controls Wt. 56 Ton

SHAPER—Smith & Mills 25″—1945
Used 1 Month—like new—P.R. Traverse
Universal Table—Swivel Vise

DOALL—CONTOUR SAW #16V (1942) Bargain $700.00
BRIDGEPORT VERTICAL MILL—Collets 1942—Bargain $895.00

SAW—NEWTON COLD CUT—Late
32″ diam. Blade 10″ diam. capacity
D. C. Variable Speeds 2 Motors A. C. Wt. 5 Ton

(2) J & L AUTOMATIC THREAD GRINDERS—1943
Models TG-1245—Cap. 12″ x 45″—5 Motors

PRESSES	TONS	STROKE	DIE SPACE	TYPE
(2) Bliss #6	125	2″ & 5″	24″ x 32″	SS, Double or Single Action, b. g. (1942)
(2) Clearing (F1200-42)	200	One @ 26″— One @ 30″	38″ x 44″	SS, Single Action all steel (1942)
(3) Bliss #78½ (#310)	450	18″	52″ x 36″	SS, Single Action, b. g. (Rebuilt 1941)

KINGS COUNTY MACHINERY EXCHANGE

MONA MEMBER

408 ATLANTIC AVENUE BROOKLYN 17, N. Y.
PHONES: TRiangle 5-5237, 5-5212, 5-5213

BARGAINS! BARGAINS!

MACHINE TOOLS, CRANES, PUMPS, TRANSFORMERS

HERE IS *YOUR* OPPORTUNITY TO *SAVE!*

BORING MACHINES

EXCELLO No. 112C single end; double spindle; NEW 1940
HEALD No. 49; single end; NEW 1942
HEALD No. 49; universal; single spindle; NEW 1940
HEALD No. 49-A; single end; double spindle; NEW 1941

BORING MILLS — Vertical

BULLARD 16″ 6-spindle, type D; single indexing; NEW 1943
COLBURN 72″, 2 swivel heads; P.R.T.; M.D.
NILES 100″; 2 swivel heads; M.D.

LATHES — Engine & Mfg.

BRIDGEFORD 36″x24′ centers; geared, M.D.
LODGE & SHIPLEY 36″x144″ centers; geared head; M.D.
NILES 26″x72″ centers; geared head; M.D.
NILES 48″x63′ centers; comb. boring & turning; M.D.
NILES 60″x10′ centers; geared, NEW 1943
NILES 30″x46′ bed; Boring; TIMKEN brg.; NEW 1941
N.B.P. 72″x63′ centers; Comb. Boring & Turning; M.D.
JONES & LAMSON (FAY) 20″x25″ centers; TIMKEN brg.; NEW 1941
Lo-SWING 8″x132″ centers; TIMKEN brg.; NEW 1941
POTTER & JOHNSTON 5-D-2-E Auto. Chucking; NEW 1941
SUNDSTRAND 8″x21″ centers Model E; NEW 1942

PUMPS

WORTHINGTON 3½″x18″; horizontal duplex type HDDA; 270 G.P.M.; NEW 1944
WORTHINGTON 4⅞″x24″; horizontal duplex; cap. 500 G.P.M.; NEW 1943

TRANSFORMERS

NIAGARA 1200 KVA; NEW 1941
NIAGARA 1000 KVA; NEW 1941
PITTSBURGH 100 KVA; NEW 1941

CRANES

From 5 to 30 ton capacity—all 230 volts—direct current

ALSO—GRINDERS, PLANERS, VERTICAL SHAPERS, SAWS, PRESSES, RADIAL DRILLS, MULTIPLE SPINDLE DRILLS, ETC.

THIS IS A PARTIAL LIST—MORE THAN 1000 OTHER ITEMS FOR IMMEDIATE DELIVERY — OUR PRICES CANNOT BE DUPLICATED!

HARRISON MACHINERY EXCHANGE, INC.

SOUTH 4th STREET HARRISON, NEW JERSEY

(Opposite the Harrison Station of the Hudson & Manhattan RR)
10 minutes from New York City—5 minutes from Newark, N. J.
TELEPHONE: HUMBOLDT 2-5750; 2-5775

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.
Drills—Large selection, single and multiple spindles also bench types, many of them new.
Gear Cutters—Brown & Sharpe No. 3—26″, Gould & Eberhardt 42″.
Grinders—Cylinder B & S No. 11, Planer type 16″x36″, Surface 13″x63″, also new (small) Universal bench and floor type. All with coolant, motorized.
Lathes—14″x6′ 8′, 10′—16″x6′, 8′, 10′—18″..6′, 8′ 10′—26″x16′—all cone drive, several motorized also (new) 18″x8′ and 10′ geared head, motorized.
Large stock 10″ and 12″ bench and floor type.
Planers—Single head 24″x6′, 24″x8′, 26″x8′.
Shapers—16″, 20″, 24″, B.G. crank.
Turret Lathes—J & L 2″x24″—3′x36″ also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30″, 40″.
SPECIAL—New totally enclosed dust ,proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼″ from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.
WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. .What we have today may be sold tomorrow, so a list is really not dependable.
Drill—Foote-Burt No. 25 24″ Hi Duty 3″ capacity in steel, motor attached.
PATTERN MAKING MACHINERY—42″x 16′ bed wood lathe, compound rest, rack and pinion feed to carriage; 16″ heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting able also tiling arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

For more than 80 years

THE NAME "HILL-CLARKE MACHINERY" HAS MEANT THE BEST BUYS IN MACHINE TOOLS . . . . . .

AUTOMATICS

No. 2 Brown and Sharpe
No. 61 New Britain 6 spindle 2¼"

DRILLS

No. D-8 Colburn No. 6 Morse Taper
No. 2LMS—26"—2 Spdl. L.G. (1945)
No. 2LMS—26"—4 Spdl. L.G. (1942)
No. 2LMS—14"—4 Spdl. L.G.
No. 2MA6—15"—4 Spdl. Avey
No. 3B—24"—6 Spdl. Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
No. 4 BL Natco—36 Spdls.
7'-15" Col. American Full Universal

GEAR MACHINES

No. 61-A Fellows Gear Shapers (1942)
No. 615-A Fellows Gear Shaper (1942)
No. 712 Fellows Auto Indexing (1943)
11" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HOR. BOR. MILLS

No. 31 Lucas, 3" bar
No. 3A Universal, 3" bar
Rockford, 3⅛" bar
No. 48-A Heald Borematic

GRINDERS

4"x12" Landis, Model H (1942)
4"x18" Landis Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Cincinnati, Model ER (1942)
10"x18" Norton Type C Plain (1943)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"

10"x24" Landis Type C Universal
12"x36" Landis Type LCH Universal (1945)

No. 5—8"x24" Covel Hydr. Surf (1941)
24"x24"x84" Mattison Hydr. Surf
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)

72A-3 Heald Internal Grinder
72A-5 Heald Internal Grinder

10"x72" Colonial Broach Grinder

LATHES

14"x6' Hendey
15"x5' Sebastian
16"x54" centers LeBlond
18"x6' American
22"x48" centers Monarch (1942)
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model B (1942)
8"x15" Sundstrand, Model D (1943)
8"x15" Sundstrand, Model E (1942)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 2 B & S Univ. Cone Dr.
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand Electromil (1942)
No. M-18 Milwaukee Simplex (1942)
No. M-24 Milwaukee Simplex (1942)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hyd. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x132" Pratt & Whitney Thread Miller
4" Taylor & Fenn Spline, M.D.
Ingersoll Traveling Column Miller
24"x24"x12' Ingersoll Adj. Rail
72"x48"x12' Ingersoll Adjustable Rail

MISCELLANEOUS

Model H-7 Micromatic Hydro Honer
Model H-705 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
No. 22-C Racine Shear Cut Hack Saw
No. 20 Bliss O.B.I. press
No. 2 V & O O.B.I. press
No. 0 Bakewell Tapper
Baush Tapper

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERT. BOR. MILLS

34" King
42" Bullard New Era
52" King
72" Cincinnati
72" Niles Extra Heavy
84" Betts

ReMANUFACTURED (ORIGINATED BY US) MACHINE TOOLS

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BLVD.

Chicago 6, Ill.

SOLVE YOUR MACHINE TOOL PROBLEMS IN ONE MOVE

CALL WORCESTER 6-5175
For Immediate Action

MILLERS

1—Cin. #1-M pyramid Column Vert. Miller, tbl. wkg. surf. 37"x10½" long, feed 22" cross 12" vert. 16" spdle speeds 12, range 62-1000 RPM.

3—U. S. #MM-1-6 right hand multi-miller arranged for dbl. V-Belt, motor driven, tbl. wkg. surf. 21½"x6" long, power feed 6" spdle speeds 8 range 133-2360 RPM.

Cin. 1-18 Pl. Auto. Miller, late type, tbl. wkg. surf. 10"x35½" long, feeds 18 vert. 8" spdle taper #40, spdle speeds 17, range 40-1500 RPM.

Cin. #0-8 Pl. Auto. Miller, tbl. wkg. surf. 6½"x18¼" long, feed 8" vert. 6" taper spdle #40 spindle speeds 10, range 75-1100 RPM.

GRINDERS

1—Cin. #2 Centerless Grinder Filmatic Bearing; capac. 1/16" to 3½" diam. Serial No. 2M2HIL-705 latest type, Hyd. truing attmt, thru feed work rest, wheel profile truing device, auto infeed attmt., infeed workrest; blades and guides and other accessories, practically new, other No. 2 and 3 Cin. Grinders in stock.

FORGING MACHINES

National 3", 4", 5" and 7½" Forging Machines, M.D.

SHAPERS

1—Stockbridge 24" motor driven Crank Shaper, V-Belt, max. stroke 24¾" stroke 8 range 7-92 strokes per min.

RADIAL DRILLS

American 4'11" col. triple purpose Radial Drill #5 Morse Taper 32 speeds, range 20-650 M.D.

CHUCKING MACHINES

3—Potter & Johnson Auto. Chuck. Machine No. 6DRE, sw. over bed way 34", sw. over cross slide 21" diam., total turret slide travel 18", with tooling, M.D.

MISCELLANEOUS

1—Bliss 10" 2-high clad rolling Mill: direct motor drive 100 H.P., forced feed mech. lubricator 4 pair rolls 1 reel 16" diam. 16" face direct drive with 7½ H.P., Lincoln induction motor and control, edge rolling attachment.

LATHES

1—Pratt & Whitney 20"x48" Model B geared head motor in base engine Lathe; actual swing 21¼" dist. betw. cens 48" hole thru spdle 2" 16 spdle speeds.

BORING MILLS

2—Bullard 36" "Spiral Drive" Vert. Bor. Mill, face of turret to tbl. 34", clear under cross rail 27½", vert. trav. of turret 26⅝", clear under S.H. slide 16", 3 and 4 jaw chuck, approx. wght. 17,500 lbs.

Botwinik Brothers
OF MASS., INC.
5 SHERMAN ST., WORCESTER 1, MASS.

NEW PRESSES, BRAKES & SHEARS

IMMEDIATE DELIVERY FROM STOCK

New Schill Hydraulic Presses 4 Column, down stroke, Fast Ram Speed, Hydraulic Return, Removable Cap Slide with Positive Knockout, Selective Stroke, Pressure Control, Removable Bolster, Bed accommodates drawing attachments 25-50-75-100 Tons.
Columbia Power Press Brakes All Steel 6'x¼"—8'x¼"—10'x3/16" (New)
Columbia Power Squaring Gap Shears All Steel, 10'x¼"—6'x¼"—10'x3/16"—12'x3/16" (New).
Whitney Jensen All Steel Power Squaring Shears 36"x16 ga.—42"x16 ga.—42"x14 ga.—60"x12 ga. (New).
Thomas Presses OBI, 56-80 and 106 tons straight side, single crank, double crank: Double crank gap frame from 75-500 tons.
New Walsh inclinable Presses 6, 12, 18, 20, 24, 28, 38, 55, 65 & 90 Tons.
Callahan No. 181½ Rotary Body Former (New).
Reading Keyseater (NEW) Capacity ⅛"x⅜".
New Whitney Angle Iron Bender (NEW) No. 61 Hand Operated. Capacity—all sizes of angle iron and flat bars including up to 3"x3"x⅜".
(New) Royersford Deep Throat Foot Presses, 8 Tons Pressure.

RECONDITIONED AND GUARANTEED

Bliss No. 78½ SS, SC Tie Rod, triple back, geared, twin drive, 415 ton, stroke 18". Excellent condition.
Bliss No. 77½ SS, SC geared, twin drive, 275 ton, stroke 14". Excellent condition.
Bliss No. 304 (1942) 55 Tons Straight Side Press, 8" Stroke, 12" Shut Height, Bed 17"x17" Motorized. (3 in stock.)
Grotnes Double End Flanger, M.D. Hand Fed. 14" dia. up.
Grotnes Double End, M.D. Adjustable Steel Drum Corrugator. Hand fed.
Buckeye Hydraulic Press 4 Column, Upmoving Ram, Stroke 36" Daylight 72", Platen 22"x36". (3 in stock.)
Watson Stillman Hydraulic Presses 35-65-100 Tons, Equipped with Motorized Pump Units.
Watson Stillman Die-Hobbing Press 100 Tons. With Hand Operated Pump.

EDWARD FRANKLIN SCHILL CORP.
41 CORTLANDT STREET NEW YORK 7, N. Y.
WORTH 2-2473 and WORTH 2-0232
MONA MEMBER

PRESSES

IMMEDIATE DELIVERY

450 Ton Press, Double Action Toggle 96x 60 Bed. 22" Blank, stroke, w/cushions, Toledo #268 ¼. Just taken from operation.

60 ton. Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel (15).
200 ton 12" stroke, 27x27 bed, Bliss, 43'.
#56 Toledo, 4" stroke, 21x21 bed, 15½" shut height.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke, 21x27 bed, 110 strokes per min., Bliss, latest type.
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late Type
Inclinable, Walsh, new, 20 to 70 ton, immed. delivery from stock.

AUTOMATICS, LATEST TYPE

#0G B & S, late type
1" New Brit. Grid., 6 spdl.
1⅜ R4—New Brit. Grid.
1½ Cone—8 spdl. ('39)
9/16 RA6 Acme Grid.
2¼ Cone, 6 Spdl., $6000.00
16" 8 spdl. Bullard Multaumatics, pract. new, $9000.00 ea. (5), with some tooling.
12" 8 spdl. Bullards, late type, lots of tooling.

HORIZ. BORING MILLS

3" Bar De Vlieg 6' bed, late type
3" Bar Univ. 6' bed, late type

PAUL'S MACHINERY COMPANY
MONA MEMBER
6111 Vermont Avenue
Detroit 8, Michigan
TYLER 7-6300

HASCO'S OFFERINGS

Immediate Delivery

WARNER & SWASEY #2A Universal Turret Lathe, PRESELECTOR HEAD, Bar & Chucking, Tooling, Serial over 640,000.

LANDIS 10"x18" Plain External Cylindrical Grinder, HYDRAULIC FEED, Purchased NEW 1941, Just out of operation.

CONOMATIC 1⅝" 8 spindle Automatic Screw Machine, fully equipped, NEW 1943.

VERSON 5'6" Power Press Brake, 45 ton Capacity, Motor Driven, ALL STEEL.

All for Sale by

HASCO MACHINERY COMPANY
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BENNETT SPECIALS

42"x18"x16' N.B.P. Frog & Switch Planer, 50 h.p. A.C., M.D.
7' Carlton 17' col. Radial, 1943
3½" bar Cinci. Gilbert Table Type Mill, 84" spin. to outer support, 42" spin. to table, 1943.
36"x32' N.B.P. Lathe, 2 carr., T.A.
Nd. 3K Kearney and Trecker Vertical Miller, 1942
No. 2MH Cincinnati Universal Miller, 1944
No. 3 W. and S. Univ. Turrets, bar, late (3)
20"x144" centers L & S Lathe, Select. Hd.
20"x86" centers Hendey Lathe, T.A., Collets
18'x120" centers Amer. Lathe, T.A., Cone M.D.

BENNETT MACHINERY CO.
30 Church St. New York 7, N. Y.

"WALSH" PUNCH PRESSES

Size	Stroke	Delivery
6 Ton	1¼" or 1½"	10 days
12 Ton	1½" or 2"	Immediate
18 Ton	2" x or 2½"	Immediate
20 Ton	2½" or 3"	Immediate
24 Ton	2" or 2½"	Immediate
28 Ton	2½" or 3"	Immediate
38 Ton	3", 3½", or 4"	Immediate
55 Ton	3" or 3½"	Immediate
65 Ton	4" or 4½"	Immediate

All Presses Complete with Drive, Motor, Counting and Safety Devices.
Roll Feeds For All Presses.
Two Weeks Delivery.
Time Payments Arranged.
Exclusive Distributors

SCHULTZ & ANDERSON CO.
115 Edison Place, Newark, N. J.
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FOR SALE
TURRET LATHES

(7)—#3 W. & S. Universal Turret Lathes (mf'd new 1942). Bar feed, air chucks & chuckers. All machines m.d. with 2-speed 5 HP 220/60/3 motors.

Priced for Quick Sale

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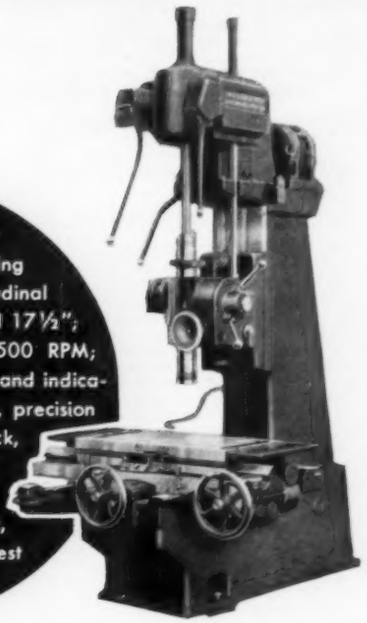
Indianapolis QUALITY MACHINE TOOLS

PARTIAL LIST OF MACHINES NOW IN STOCK



Fosdick Jig Borer, Model 30, Table working surface 18" x 36", longitudinal table travel 30", cross travel 17½"; twelve speeds from 60 to 1500 RPM; equipped with measuring rods and indicators, 16" power rotary table, precision boring head, Jacobs chuck, collets, etc. Motor and control 3 phase 50/60 cycle, 220/440 volt, 1500/1800 RPM. Latest Model.

AUTOMATICS

2G Brown & Sharpe, H.S. 1½" capacity. New, 1943.
9/16" RA-6 Acme-Gridley. New, 1943.
1⅝" 6 Spindle Greenlee. New in 1942.
3½" RA-6 Acme-Gridley. New, 1942.
6" 4 Spindle Conomatic. New, 1942.
★**Bullard Multaumatic, six spindle Model D, single index. Late Model.**

BORING MILLS

No. 42 Lucas Horizontal, 4" bar, with rectangular revolving table, star facing head, motor and control. New, 1942.
★**Universal Horizontal 4" bar, table type, with facing head, rotary table, boring bars, motor and control. New, 1943.**

BROACHES

No. CPC 6-30 LaPointe Hydraulic Vertical. New, 1941.
No. CPC 6-36 LaPointe Hydraulic Vertical. New, 1943.

DRILLS

3' and 4' Dreses Radial, 11" column, enclosed head, 1938 model.
No. H3 Barnes Hydram, 8 speed. New, 1942.
42" Cincinnati-Bickford, single spindle.
KH 2 Allen, 6 spindle. New, 1943.
No. 3 Baush Multiple Spindle.
Barnes Horizontal Deep Hole, two spindle.

GEAR CUTTERS

No. 6 Gleason Gear Tester.
12" Gleason Straight Bevel Gear Generator. Late model.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, Fellows Gear Shapers.
No. 12 Barber Colman Hobber.

GRINDERS

No. TG615 Jones & Lamson Thread Grinder. New, 1943.
No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle, 1941.
★**14" x 48" Cincinnati Universal, Filmatic bearing, internal spindle. New, 1942.**
No. 3 Brown & Sharpe Universal. New, 1943.
4" x 18" Landis, Type H.
6" x 18" Cincinnati, Filmatic Bearing.
10" x 72" Norton Cylindrical.
10" x 36" Landis Hydraulic. New, 1943.
No. 22 Heald Rotary Surface Grinder. New, 1943.
No. 18 Blanchard, 30" chuck. New, 1942.
16" x 16" x 48" Thompson Model C, Surface.
3B Abrasive, with chuck. New, 1943.
No. 5 Brown & Sharpe Surface. New, 1942.
6" x 12" x 18" Thompson Surface Grinder. New, 1942.
No. 2B Reid Surface, for wet grinding.
No. 16CP16 Bryant Hydraulic Internal Grinder. New, 1942.
No. 75A Heald Internal. New, 1943.
No. 72A3 & 72A5 Heald Internal. New in 1943.

LATHES, ENGINE

Hendey 12" x 30", g.h.
Reed Prentice, 14" x 30" g.h.
Lodge & Shipley Tool Room, 14" x 54", rel. att. New, 1943.
Reed Prentice 14" x 78" Toolroom. New, 1943.
American Pacemaker, 16" x 30". New, 1942.
Reed Prentice 16" x 54". New, 1943.
Sidney 18" x 54". New, 1943.
Lodge & Shipley 20" x 48". New, 1943.
★**Bertram 28" x 240" "Timesaver", two carriages, with rapid traverse. Canadian made from Niles patterns. New, 1942.**
American 30" x 20' g.h.
Lodge & Shipley 48" x 54", cone driven.
Carroll Jamieson 18" x 5', O.D.
South Bend 14½" x 6'. New, 1944.
Lo-Swing, models IMP and R.

LATHES, TURRET

Warner & Swasey No. 4A, with chuck, 7½" hole.
★**Warner & Swasey No. 2A, preselector, Cross sliding turret. New, 1943.**
Warner & Swasey No. 1A, preselector, cross sliding turret. New in 1942.
Jones & Lamson No. 9A. New, 1943.
Gisholt No. 2L, cross sliding turret. New, 1943.
Acme No. 1 Universal, saddle type. New in 1941.
Bardons & Oliver No. 7 Ram Type, Bar feed and tooling. New in 1942.
Foster No. 5 Universal, Bar feed. New, 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal. New, 1942.
Bardons & Oliver No. 3 Universal, motor in base. New, 1941.
Warner & Swasey No. 2, oversize. New, 1942.
Bardons & Oliver No. 2, bar feed. New, 1941.
Bullard, 36" Spiral Drive VTL. New, 1943.
Bullard 42" New Era, VTL.

MILLS

★**Cincinnati No. 4 Universal, High Speed Dial Type with rotary table, vertical attachment, slotting attachment, dividing head, motor and control. New, 1942.**
Cincinnati No. 2M Universal.
Brown & Sharpe No. 2A Universal. Late Type.
Brown & Sharpe No. 1 Universal. New 1941.
Kempsmith Maximiller Plain, No. 3.
Brown & Sharpe No. 3B Plain. New, 1943.
Brown & Sharpe No. 2B Plain.
Cincinnati No. 2MH Plain, latest model.
Cincinnati Hydrotel 28" x 60", depth & tracing.
Milwaukee No. 3H Vertical. Latest model.
Milwaukee No. 2K Vertical. New, 1942.
Cincinnati No. 2 Vertical. New, 1940.
Cincinnati No. 08 and 2-18 Rise and Fall.
Cincinnati No. 1-12 Automatic.
Cincinnati No. 3-36 Hydromatic.
Cincinnati No. 34-36 Hydromatic High column with Hydrotel.
DeVlieg Supermill No. 31B.
Brown & Sharpe No. 12. New, 1942.
Whitney Hand Mill, No. 6.

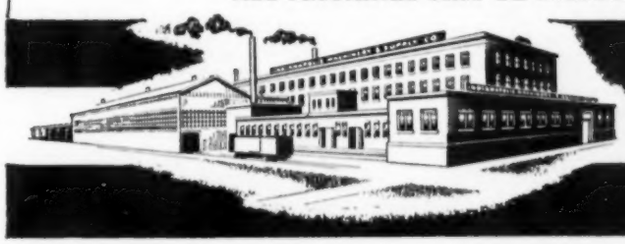
MISCELLANEOUS

Jones & Lamson Comparator.
Cleveland Rigidturner, No. 616.
18' x 18" Marvel Hydraulic Saw.
18" x 18" Racine Hydraulic Saw.
12" x 12" Peerless High Speed Saw.
Bertsch 6' x ½" Bending Roll.
No. 26F Norton Hydrolap.
No. 5B Standard OBI Press. New.
No. 8-6 Zeh & Hahneman S. S. Geared Press.
Toledo No. 41 Horn Press.
Tapper, Leland Gifford 3' Radial, No. 3 M.T. New, 1941.
24" Cincinnati Worm Feed Rotary Table.
Dodds Dovetail Machine, 15 spindle.

PLANERS AND SHAPERS

Cincinnati Planer, 42" x 42" x 20'. Four heads D.C.
Cincinnati Planer 52" x 36" x 40' four heads, box table. D.C. motor drive.
6" Ammco Bench Shaper.
Cincinnati 24" Shaper, Universal table and power down feed. New, 1943.
Smith & Mills 28" Shaper.
Cochrane & Bly No. 14 Vertical Shaper. New, 1942.
Pratt & Whitney 6" vertical shaper. New, 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE



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High Quality NEW, USED & REBUILT Machine Tools
1959 S. Meridian St., Indianapolis 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

AUTOMATICS

⅞", 1¼" & 4½" Cone 4 spindle
1⅞" Conomatic 8 Spindle
1⅝" New Britain No. 61 Six Spindle
2⅝" Acme Gridley 6 spdl. RA6
1⅛" Cleveland 4 Spindle
2"x18" Cleveland, model B
No. 454 New Britain Chucking
14"x19", 16"x33" & 20"x25" Fay
16"—6 station Bullard type D Mult-Au-Matic
8"—6 station Bullard Mult-Au-Matic
No. 2 FU Foster Fastermatic
No. 3D Gisholt Simplimatic
1" type S Economy automatic shaver

GRINDERS, CYLINDRICAL

4"x12", No. 4H Landis hydraulic
6"x18" Norton semi-automatic hydr.
6"x18" Norton type C hydraulic
6"x18" Landis type C hydraulic
6"x18", No. 10 Brown & Sharpe elec. hydr.
Nos. 10 & 11 Brown & Sharpe mechanical
Nos. 1 & 2 Brown & Sharpe universal
No. 13 Brown & Sharpe universal
10"x18" & 10"x50" Norton mechanical
10"x18" Landis Type C hydraulic
10"x24" & 16"x72" Landis mechanical
10"x36", No. 2½ Bath universal
14"x36" Landis type C hydraulic
16"x36" Landis type D semi-auto. hydr.

GRINDERS, SURFACE

16", No. 10 Blanchard rotary
30", No. 16 Blanchard rotary
12" & 16", No. 22 Heald rotary
16" & 24" No. 25A Heald rotary
8" Pratt & Whitney rotary
12" Walker model DA rotary
6"x18", No. 2 Brown & Sharpe
8"x22" Abrasive No. 3
8"x24" Abrasive No. 34 vertical
10"x24" Norton hydraulic
12"x48" Thompson hydraulic
14"x60" Mattison hydraulic
14"x36" Pratt & Whiney vertical

LATHES, TURRET

Nos. 3, 4, 5, 1L & 3AL Gisholt universal
No. 5 Jones & Lamson universal
Nos. 3, 5, 1A & 3A Warner & Swasey universal
No. 2F Foster Fastermatic
No. 5 Foster universal
Nos. 2G & 3 Morey universal
Nos. 4 & 4B Midland universal
Nos. 5 & 7 Bardons & Oliver universal
1½" No. 601 DD Oster
3"x36" & 4"x34" J.&L. flat turret
No. 5 Foster, old style
28" Gisholt, old style
Nos. 4, 4 univ. & 6 W.&S. old style

MILLS, BORING

3" No. 3A Universal horizontal
4", No. 42 Lucas horizontal
7" Barrett cylinder boring
53" & 100" NBP vertical

MILLERS, KNEE TYPE

Nos. 2AS, 3B & 4B Milwaukee
No. 3 Cincinnati High Speed Dial
No. 3 Van Norman duplex
No. 12 Garvin
No. 3 Cincinnati universal
Nos. 2M, 2, 3, 4 HP Cincinnati vertical
No. 3V Van Norman vertical
Nos. 2H, 3H & 4H Kearney & Trecker vertical
Fray All Angle vertical
Vernon vert. mill & jig borer
No. 2A Pratt & Whitney jig borer

SHAPERS

6" Pratt & Whitney vertical
12" Whipp
16" Milwaukee
16" Gould & Eberhardt
20" Gemco universal
24" Gould & Eberhardt
24" Columbia universal
24" Gemco universal
28" Gould & Eberhardt Invincible
36" Rockford shaper planer

MILES MACHINERY CO.
SAGINAW, MICH.

NEW IN 1943
5 OVERHEAD TRAVELING CRANES
FOR SALE

4—10 Ton Whitings, 70′ span, 3 motors
1—10 Ton P & H, 70′ span, 3 motors
also
1—7½ Ton Erie, 70′ span, 3 motors
ALL 3/60/440 VOLTS

WRITE — WIRE — PHONE

INDUSTRIAL PLANTS CORPORATION
90 WEST BROADWAY NEW YORK 7, N. Y.

McDONALD
USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive No. 34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp, Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20"x8' Grd. Hd., M.D. & 28"x12' Lathes Monarch Model "C"
American 24'x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills.
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

CINCINNATI CENTERLESS LAPPING MACHINE, 1941

Equipped with 220/3/60 Motors
Excellent Condition *Price Reasonable*
Photograph on Request

CASSIERE MACHINERY CO.
130 Richmond Street
Providence 3, Rhode Island

Bor Mill. Hor. 3" G and L. MD.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin-Bick.
Lathe, Turret 3-A W and S. S.P.D.
Lathe, 36"x28' Betts, T.A., MD.
Millers, Plain No. 3 K and T. No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

FOR SALE—LATE TYPE
BROWN & SHARPE
HIGH SPEED AUTOMATICS

Model 2G—Serial No. 11339—1½" cap.
Model 0G—Serial No. 12356— ⅝" cap.
Model 2 —Serial No. 6634 —1¼" cap.
Model 00 —Serial No. 7335 — ⅜" cap.

CAPITOL MACHINERY CORP.
253 Centre St., New York 13, N. Y.
WOrth 4-7615-6

PANTOGRAPHS

1—3Z Gorton Pantograph for heavy cutting with ½ H.P., 220/3/60 Motor.
1—3L Gorton 3 Dimensional Pantograph with ½ H.P., 220/3/60 Motor.
Write: A. E. ARMSTRONG, 21 Colony Rd., West Springfield, Mass. *for details and prices.*

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

LARGE LATHE

72" x 24' Putnam Motor Driven—with raising blocks to swing 92"—Still Inspected in Operation.

SUN MACHINERY CORPORATION
36 VAN VECHTEN ST. NEWARK 5, N. J.

FOR SALE

1—6" 4 Spindle Conomatic. Fully Equipped. Serial #4487KK.
1—3½ RA6 Acme Gridley. Fully Equipped. Serial #94103.
Will sell Conomatic separately, but will not sell Acme Gridley without selling Conomatic.

F.S.-4932, AMERICAN MACHINIST
520 N. MICHIGAN AVE., CHICAGO 11, ILL.

ENGINEERED REBUILT MACHINE TOOLS

FOR MILLS . . . . . SEE SIMMONS

BORING MILLS

48" and 54" Colburn
84" and 96" Niles-Bement-Pond
10' Betts, Three Heads
10' Niles-Bement-Pond
12' Niles-Bement-Pond
12' Betts, Extra Heavy
4" Bar Lucas Horizontal, Table Type
6" Bar Simmons Horizontal (1943)
2-Spindle, 6" & 3½" Jones Horizontal, Planer Table
5" Bar Sellers Floor Type
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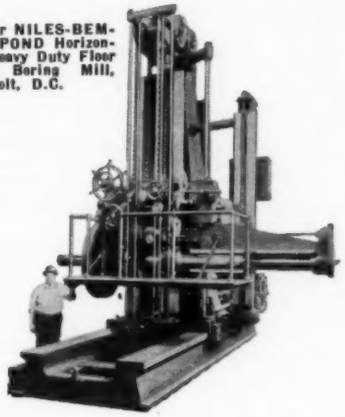

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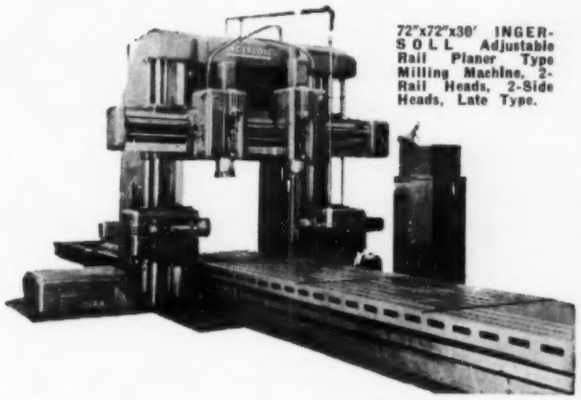

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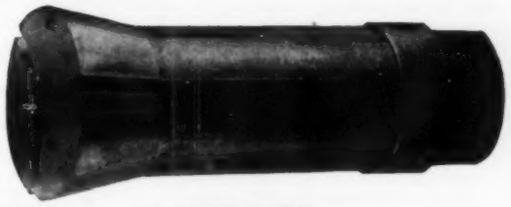

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Continued from page 260)

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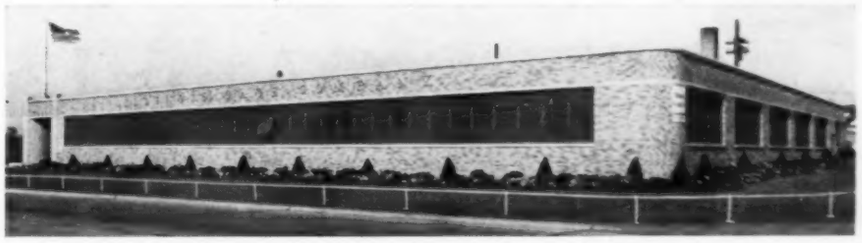

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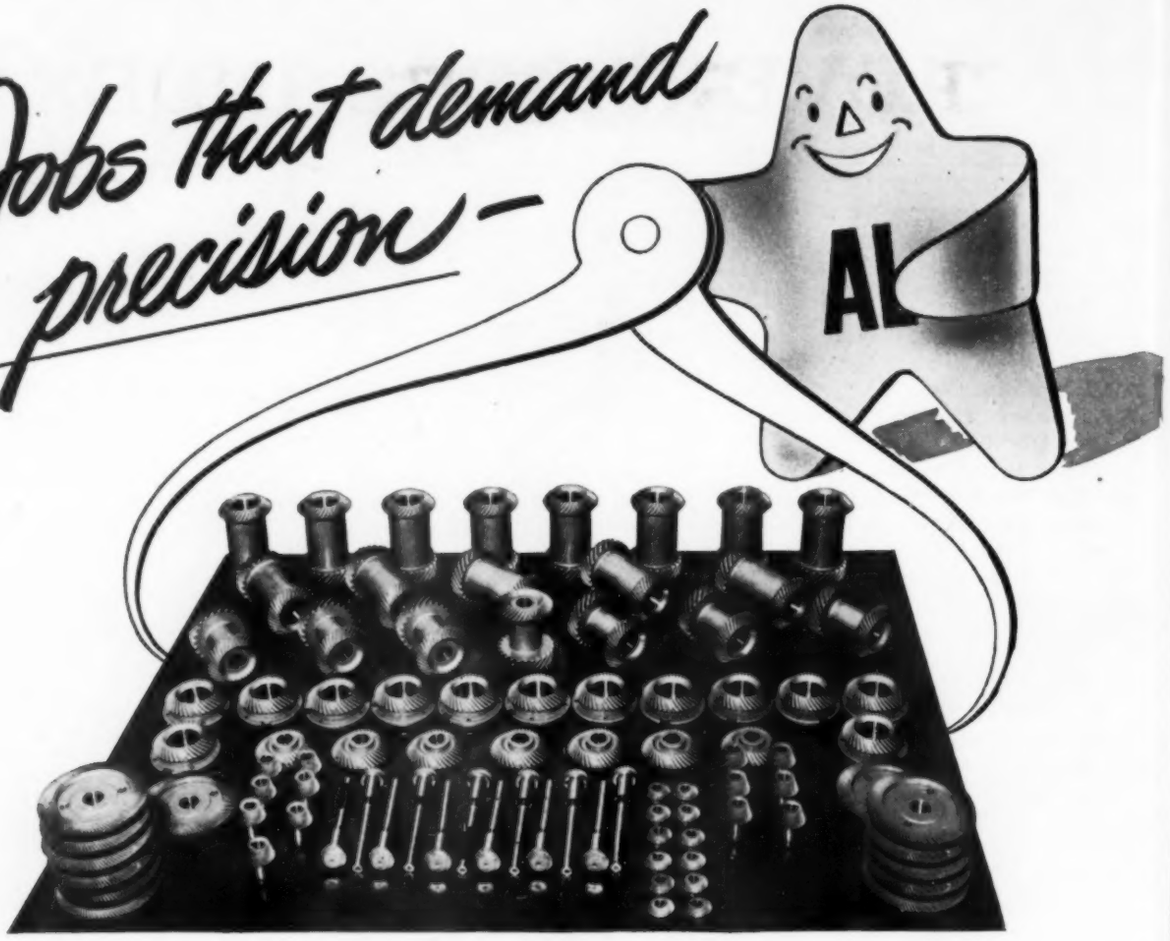
Jobs that demand precision—



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Contains full information, certified as laboratory tested and proved, on the physical properties and characteristics of DEWARD Tool Steel, and best methods of handling and treatment. *Send for your copy.*

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Wherever your specifications call for hardened machine parts in precision work, you'll gain greatest advantage by using DEWARD Oil-Hardening Tool Steel—famous for its freedom from distortion after heat treatment.

This quality caused the selection o DEWARD for the complete set of precision gears illustrated above, which must run absolutely true in operation. After grinding, the gears are heat treated at 1425-1500° F., oil-quenched and then drawn at 750° F., resulting in a hardness of 48-51 Rockwell C. With no distortion, the final regrind and lapping of the bolt before assembly becomes a simple, quick, low-cost operation.

For any jobs of this general nature, let us show you how DEWARD can save you time and money in production, give you a better finished job—*or both!* Our Mill Service Staff is at your command, without obligation.

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Pa.

TOOL STEEL DIVISION: DUNKIRK, N. Y.

Fine Tool Steels Since 1854 W&D 1779 AL

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AMER MACH—22318—June 3

There's a Pittsburgh Power Driven Brush for every Industrial Use!

- GLASS
- STEEL
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- AUTOMOBILE
- RUBBER
- PAPER
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Pittsburgh brushes are specifically designed to meet your particular finishing requirements. They're tough enough, stiff enough to resist abrasions. They're soft enough to improve surface texture. And the perfect balance of Pittsburgh brushes carefully controls distribution of the brushing stock—provides top efficiency, enduring economy.

In the complete Pittsburgh line are brushes of all types. "Perfect Balance" sections. Wheels and assemblies. Uni-fill scratch brushes.

Consult the Pittsburgh engineering representative today. He'll gladly work with you in developing any type of power-driven brush. And you can be sure it'll do the job right!

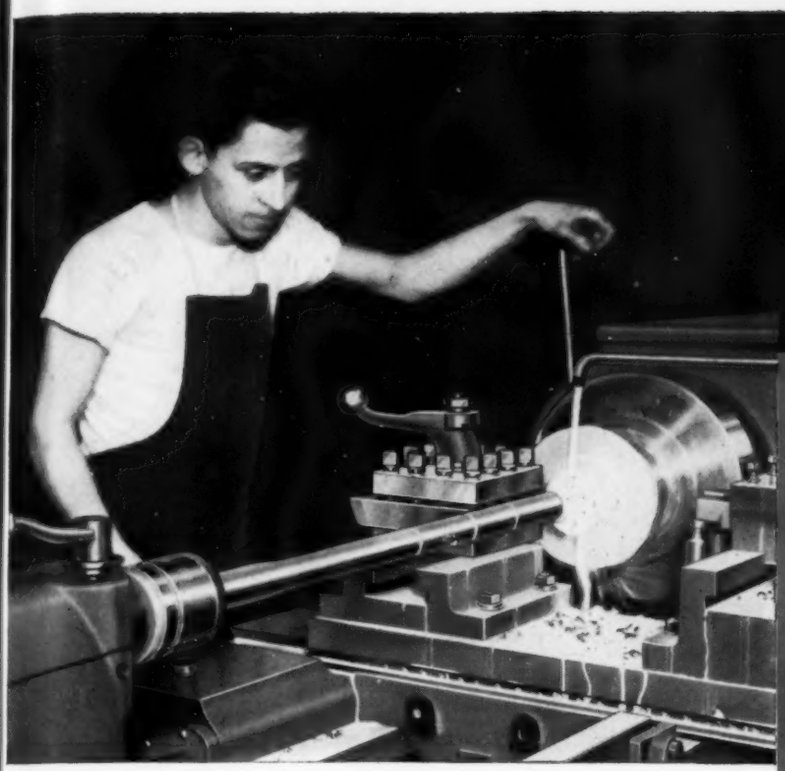
FREE!

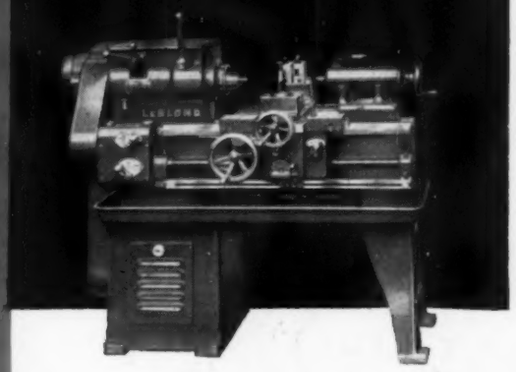
Steel rule and depth gauge, 6", complete with pocket clip, and atttractive leather case. Yours for the asking . . . write Pittsburgh Plate Glass Company, Dept. W-3, Baltimore 29, Md.

Power Driven BRUSHES

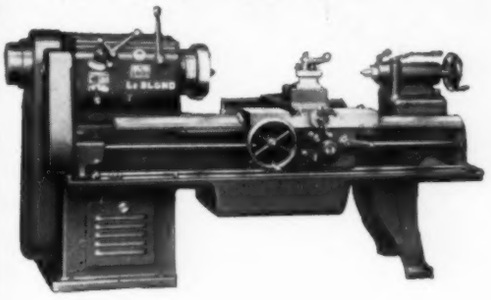
BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

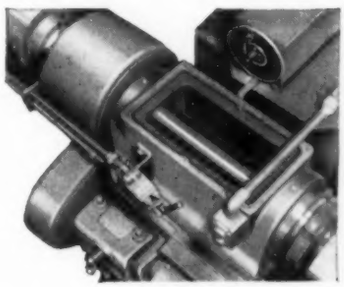




13" RAPID PRODUCTION with your choice of 3 optional headstocks and many spindle speed ranges.



17"-20" RAPID PRODUCTION LATHES for high speed heavy duty metal turning.



SPECIAL PURPOSE RAPID PRODUCTION LATHES also available like the 17" gearless headstock model shown above.

get RAPID PRODUCTION

with LeBlond Rapid Production lathes

These speedy, low-cost lathes are LeBlond precision built to turn metal accurately and quickly—at the rate of 3600 rpm on one model. All three swing sizes—13", 17", and 20"—have set production records for manufacturers all over the world.

They're ideal for plain turning, facing, and boring of aluminum, brass, bronze, magnesium, plastics . . . where high spindle speeds and accuracy are required. Will turn standard ferrous metal as well.

Hardened and ground steel bed ways front and rear now furnished at no additional charge.

You can solve your high speed production problem with a LeBlond Rapid Production Lathe. For further information, see our catalog in SWEET'S Mechanical Industries File, or

send for illustrated bulletins.

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

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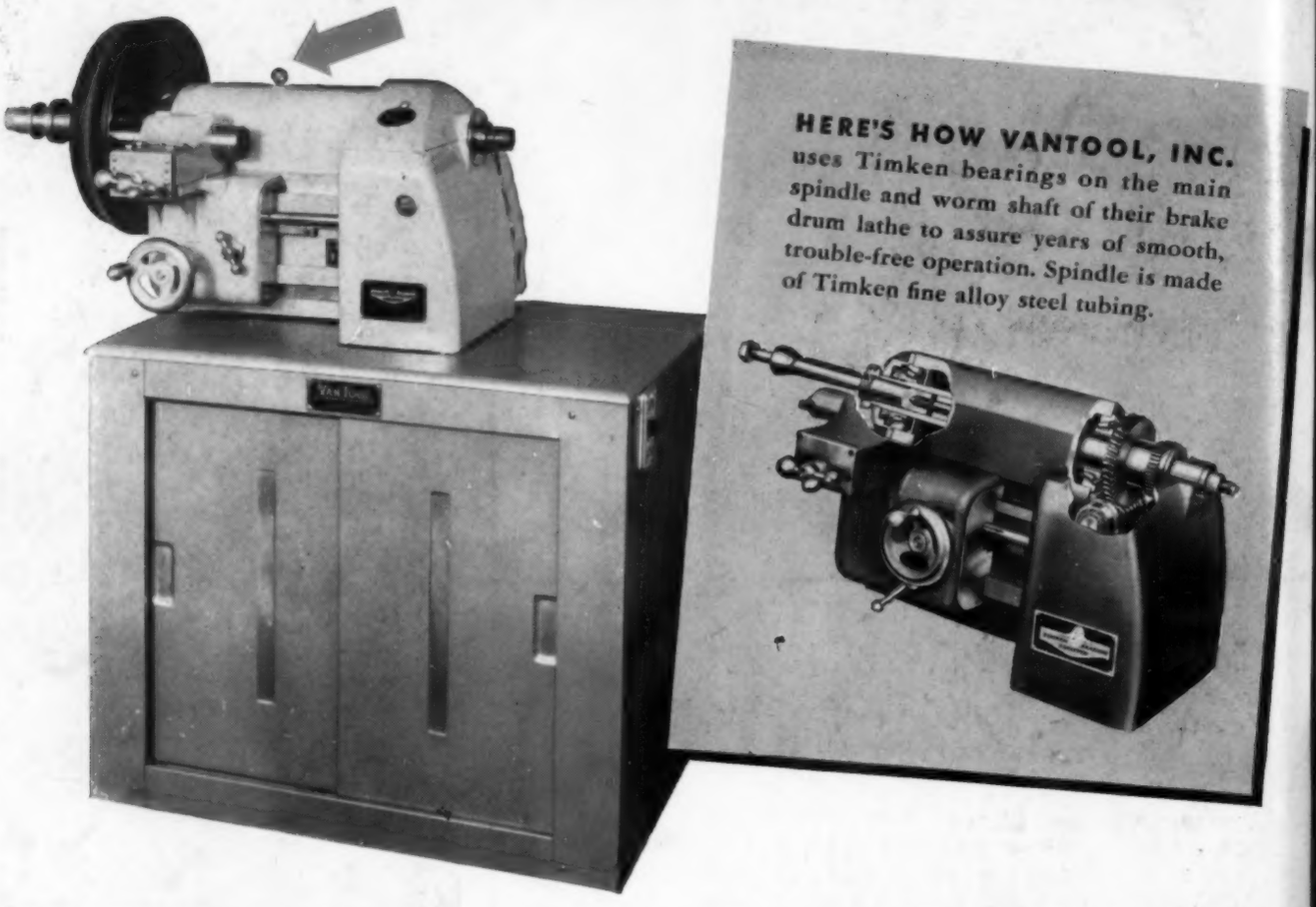
LeBLOND

5 CENT BALANCING ACT... proof that Timken® bearings cut out the chatter



HERE'S HOW VANTOOL, INC. uses Timken bearings on the main spindle and worm shaft of their brake drum lathe to assure years of smooth, trouble-free operation. Spindle is made of Timken fine alloy steel tubing.

BALANCE a five-cent piece on top of a VanTool brake drum lathe and it will stay that way—*even when the lathe is making a substantial cut at high speed,* as shown in the photograph.

To help make this freedom from vibration possible, VanTool, Inc., mounts main spindles and worm shafts on Timken tapered roller bearings. Timken bearings eliminate chatter and open the way for faster, more precise machining, reduced operating and maintenance costs, longer machine life.

The rolls and races of Timken bearings are made of Timken fine alloy steel for toughness—then case-hardened for wear-resisting surfaces that retain precision longer. Line contact between rolls and races provides maximum support for the spindle—deflection is eliminated.

Remember that Timken bearings in your product add a valuable sales feature. They build greater acceptance for your product among customers. So when you specify bearings, specify "Timken". And when buying new equipment, always look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.

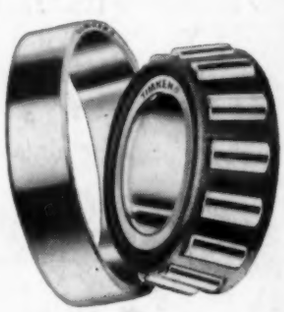
TIMKEN BEARING CAPACITY RATINGS INCREASED 25%. Since Timken bearings were re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION